REPORT RESUMES

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AN EVALUATION OF TWO METHODS USING MAGNETIC TAPE RECORDINGS FOR PROGRAMED INSTRUCTION IN THE ELEMENTAL MATERIALS OF MUSIC.

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THIS RESEARCH INVESTIGATED THE DIFFERENTIAL EFFECTS OF AURAL OR VISUAL PRESENTATION OF BASIC MUSIC MATERIALS AND WRITTEN OR VOICE RESPONSES. NEW METHODOLOGY AND TECHNOLOGY WERE EMPLOYED IN A CONTROLLED LABORATORY SITUATION WITH BOTH GRATIFYING AND THOUGHT-PROVOKING RESULTS. WHERE SIGNIFICANT EFFECTS WERE DUE TO THE EXPERIMENTAL TREATMENT, THE RESPONSE WHICH STUDENTS MADE SHOWED A GREATER EFFECT THAN DID THE STIMULUS PRESENTATION, EXCEPT IN THREE INSTANCES. THE PATTERNS OF THE EFFECTS CAUSED BY THE TREATMENT VARIED WITH THE TASKS PERFORMED AND THE KIND OF MATERIAL. THE BACKGROUND FACTORS, WHICH INCLUDED VARIOUS ASPECTS OF SPECIFIC MUSIC TRAINING AS WELL AS GENERAL EDUCATION, HAD SOME INFLUENCES UPON THE STUDENT'S BEHAVIOR. A BETTER UNDERSTANDING OF STIMULUS-RESPONSE EFFECTS HAS BEEN OBTAINED, AS WELL AS SOME DEVELOPMENT OF AN IMPROVED ENVIRONMENT FOR LEARNING ISOLATED MUSIC ELEMENTS. RESULTS OF THE INVESTIGATION INDICATE (1) THERE IS NO ONE BEST METHOD OF USING AURAL AND VISUAL MATERIALS FOR THE LEARNING OF MUSIC AND (2) THE PARTICULAR OBJECTIVE DETERMINES WHAT METHOD IS THE MOST EFFECTIVE. (LP)

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Final Report

AN EVALUATION OF TWO METHODS USING MAGNETIC TAPE RECORDINGS FOR PROGRAMED INSTRUCTION IN THE ELEMENTAL MATERIALS OF MUSIC

Charles L. Spohn
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PREFACE

This study was undertaken to investigate certain phases of the problem of learning music. More specifically, however, the research was directed toward the perception of organized sounds and symbols, as well as toward the evaluation of the effectiveness of written and voice response methods.

Since music learning is often considered a specialized interest area, every effort has been made to maximize the applicability of these data to other areas of learning which have similar problems. The hope is expressed that these findings will provide an additional understanding of the general problem of aural of visual perception resulting from different methods of stimulus presentation and/or written or voiced modes of response.

This work has been made possible by the interest and cooperation of many individuals. Graduate students, who were Research Assistants, Robert Froelich, James Lindholm, Joseph Lord, Richard Osborne, and Joseph Thomas, were most helpful by assisting in the preparation of materials and the gathering of data. The classroom teachers, Burdette Green, coordinator, John Beck, and Caroline Henning were most helpful and cooperative. Dr. D. Ransom Whitney provided invaluable assistance in the statistical analysis of the data. Professor Gertrude Kuehefuhs, chairman of the music theory area, has been most understanding and helpful. Motivation and interest provided by Dr. Ross Mooney, Professor, Bureau of Education Research and Service, and Dr. Egon Guba, Director, Bureau of Educational Research and Service, were encouraging in the early stages of the study.

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November, 1963

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PART I

COMMUNICATION AND RESEARCH IN MUSIC

Introduction

Many kinds of human behavior have evolved, and have been organized, preserved, and taught over the years as important acts of a social society. People are expected to be able to learn certain skills and information. Students have learned to perceive, to respond, to make judgments, to develop insights, to create, and to solve problems in a multitude of ways. History shows a varied background of educational processes which have been utilized to help people learn the necessary (as well as the sometimes unnecessary) behaviors.

The American school system has been largely responsible for the formal instruction of students. Experienced judgments which, by necessity, have included considerable latitude, have been made by teachers at all levels. These judgments include:

what people should learn

what they can learn

when they should learn a particular item

where they can learn

how they can learn, and

what the outcome of any learning experience should be.

These judgments are not limited to a particular subject area, but exist throughout the present educational system.

Teachers often feel that they "know" about a subject or method. Individual experience is biased since the individual did or did not acquire certain skill or information. The individual's appraisal of his experience is sometimes accurate. Everyone, however, can point to instances in which experienced judgments about a learning situation were not correct; experienced judgments often are best guesses. Judgments about learning, based on individual experience, may or may not generalize to groups of people.

The complexity of the human learning process appears to be an uncharted maze; human learning has been confused with human values. Objectivity is sometimes forsaken for vague philosophical and untestable concepts. In the past, concern about learning a particular subject tended to isolate what might be common learning problems. Misconceptions about learning are doubtlessly apparent throughout the various domains of education.

The Generality of Human Communications

Similarities exist between the instructional problems of speech, foreign language, mathematics, reading, and music. Learning in each of these subject areas is dependent upon the visual and aural perception of sounds and symbols. There are various methods of material presentation designed "to teach" concepts and skills, and develop associations. In general, methods involve a reading and/or a writing skill of verbal or nonverbal sounds and symbols. These learning problems and tasks associated with the previously mentioned subjects are problems of human communication. Weaver (1949) defined human communication broadly.* Later Carroll (1953) wrote about some of the educational problems which have to do with making society more effective in communication. One of the suggestions he proposed, as a start toward solving communication problems, was the development of communications generalists. Carroll outlined the functions of such persons as follows:

> The major initial task of the communications generalist would be to strive toward a better theoretical integration of knowledge concerning communicative codes, behaviors, and conditions. He would acquire a thorough knowledge of the characteristics of linquistic structures, examine the matrix of behavior in which these structures exist, and attempt to adduce from observation and experiment on integrated account of communicative behavior. In this enterprise, his attention would be given not only to codes found in natural languages but also to codes and communicative systems which derive from natural languages (for example, systems of writing) or which are several stages removed from natural languages (for example, signaling systems, graphics, mathematical symbolisms, etc.). The study of human cognition and problem solving would be one of the major areas of investigation by the communications generalist.

The relationship and scope that Carroll proposed between educational problems and communicative systems is considerable and involves varying degrees of complex human behavior.

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*The word communication will be used here in a very broad sense to include all the procedures by which one mind may affect another. This, of course, involves not only written and oral speech, but also music, the pictorial arts, the theater, the ballet, and, in fact, all human behavior.

Music

Music is, by Weaver's definition, a communicative system which could be included in Carroll's outline as a part of human communication. As a communicative system, music is perhaps confusing to untrained people, and a great deal more neglected. Music has a broad meaning; there would be little, if any, useful purpose served in attempting to define or delimit the work. The meaning of music is something different for each individual, depending upon his age, past experience, individual preferences, level of training, and present environment. The sounds of music, which man has generated (by means of voice and the many and varied music instruments) to express himself in nonverbal sound, have been presented in many ways. There are, however, established and well-organized nonverbal music symbols and sounds that can be identified, catalogued, and manipulated to explore human learning.

Music Learning

The learning of music can be considered in an objective manner. The notational symbols are as fundamental as the Arabic numerals used in mathematics, and as structured as the alphabet which is so vital to any language instruction. The sounds that the notational symbols of music represent are well defined and constitute an orderly and usable set of discriminatory stimuli and/or response patterns.

Music learning includes (1) the technical knowledge of music (sometimes called rudiments) and (2) the development of aural and visual perception of sounds and symbols. The technical knowledge of the fundamentals of music includes two closely related items. They are the symbols used for the notation of music, and the descriptive terminology and markings which indicate the interpretation of the notation. The symbols used in notating music represent rhythm, which is the durational value of music notation; and the same music symbol indicates a fixed tone, which can be located on a high-low frequency continuum.

The development of skills as a part of the music learning process includes three specific techniques: (1) the manual skill of notation, (2) the visual perception of notation, and (3) the aural perception of notation and sound.

The manual skill of notation means the ability to write accurately the symbols of music that represent rhythm and pitch. The visual perception of the notation of music is music reading, the skill of which is an integral part of music learning. The reading of music as a means of developing better musicianship or knowledge about music was early established as an objective of the teaching of the elements of music (Spohn, 1959). It was in these very early years that instruction was established which recognized the need for the musician to perceive music visually.

If aural perception of music symbols is accurate, music reading becomes a useful skill rather than a task involving complicated symbols. The ability to conceptualize notation and music sounds, visually and mentally, is as vital to music as is the ability to read a novel written in one's native language. It would be foolish to attempt to read a language without a basic skill to associate sounds with words. If students of language were taught to speak the words of the language without relating the sounds to an object or symbol, learning a language would be impossible and pointless. Music and language instruction often fail in achieving necessary associations. Some students never associate the sounds with the appropriate symbols, or the symbols with the appropriate sounds.

The aural perception of music notation is another skill that is considered an important part of music. Aural perception in the strictest sense is the ability to conceptualize (notating, performing, or verbalizing) music after it is heard. Traditionally, music instruction is aimed toward developing the ability to perceive aurally and make associations with music symbols and sounds. For example, the listener is able to demonstrate the skill of aural music perception when he accurately notates, performs, or verbalizes what he has heard.

Related Research

Music offers some interesting possibilities for basic research in learning. The psychological literature contains a rather significant number of studies in human behavior which have dealt with music elements. These studies, however, have seldom dealt with methods of learning. The learning problems explored by researchers of foreign language, speech, English, mathematics, and reading appear related to learning music. These people believe that there are certain basic skills which must be learned to an adequate criterion. This basic instruction involves the aural and visual perception of sounds and symbols.

Considerable information has been obtained about learning in the various domains of communication in the recent past. There are, however, voids as well as instances in which research about one group of problems is misleading when applied to similar situations. For instance, research studies have investigated the effectiveness of the aural and/or the visual presentation of different kinds of materials. Krawice (1946) investigated the relative value of visual and auditory modes of presentation for the learning of 12 nonsense syllables and 20 monosyllabic nouns. He found that the visual mode of presentation was a superior method for learning for both the nonsense syllables and the nouns. Goss and Greenfield (1958) reported that a verbal learning experience (voicing a response) was superior to seeing and discriminating when comparing positive transfer to a motor task. Pimsleur and Bonkowski (1961) compared the effects of visual presentation of a stimulus word with the aural presentation of a stimulus word. The study was an investigation of the effects of either presentation on relearning by the opposite modality. The findings supported the view that aural instruction preceeding visual instruction may have advantage over conventional methods of language teaching, if the goal is to achieve proficiency in both reading and aural comprehension. Student responses were written. Asher (1961) reported results from a similar study in direct contrast to those reported in the Pimsleur-Bonkowski study; different methodological techniques, however, were used. Responses were both written and spoken.

In music, Spohn (1959) reported an experiment in music learning in which the stimulus was presented aurally on magnetic tape and students made written responses. This learning was compared with a control group taught by means of traditional classroom methods. The experimental group showed a significant improvement over the control group in its ability to perceive aural music stimuli. A refinement of this technique was reported later (Spohn, 1962) in the presentation of an isolated music element as the stimulus. Again the results showed a significant improvement in students' ability to perceive these music stimuli as a result of aural presentation and written responses.

These six studies seem to indicate a need for the further investigation of the effectiveness of aural versus visual presentation of different materials. In each of the studies there appears to have been more emphasis on different modes of stimulus presentation, rather than on the investigation of the effects of the response mode.

Undoubtedly, other variables can influence the effectiveness of either the presentation or response mode (e.g., the technological and methodological presentation of materials). The kinds of sounds or symbols used as stimuli might also be determining factors in influencing the relative effectiveness of either a visual or aural presentation, or a written or voiced response pattern.

The Problem

In the instruction of speech, foreign language, linquistics, mathematics, reading, and music there are basic skills and information which authorities commonly agree must be learned by students. In each of the above subject areas, the skills and information necessary for more advanced learning involves the perception of specific sounds and symbols. For instance, basic reading instruction can be presented as a listening activity which is associated with sounds, either as small combinations of letters, words, or groups of words--an aural to oral approach. Another approach to basic reading is visual to aural. Analogous instructional procedures exist in speech, foreign language, mathematics, and music. There are basic symbols which the student must perceive and associations to be made before next steps in learning can be taken. It is assumed in this instruction that there are specific learning values to be gained from both the aural and visual presentation of materials.

In these subject areas certain similarities exist in the instructional procedures used to develop specific behaviors. One such similarity is the manner in which students respond while learning; students' responses to material are most commonly written or voiced. For example, instruction in foreign languages incorporates the technique of written or spoken student responses. Another similarity is in the instruc tion of mathematics. Mathematics teachers traditionally are known to send students to the blackboard with aural instructions to write two plus two, or to instruct students to copy from visual material and "solve the problem." At another time, the same student may be asked to respond aurally to the problem, "two plus two equal what?"

The experienced teacher seems to learn that a combination of different methods is important to a balanced instructional program (Turner and Fattu, 1961). There has been, however, little opportunity to isolate and evaluate the effectiveness of different methods of material presentation and to compare the effectiveness of these presentations when various kinds of responses are made. Students are often exposed to one or more methods in the belief or hope that the desired learning will result from the instruction. The literature in all areas of learning shows that optimum learning for all students is not achieved. The results do not indicate a revolutionary truth that remains unequivocal.

Traditionally, those students who achieve success in an area of learning are considered intelligent or talented. Those students who do not acquire the tasks or information according to a satisfactory criterion are neglected, and often lost to the particular learning. Farnsworth (1958) emphasizes this point about music learning:

> Common sense teaches that some humans are born monotones. These unfortunates cannot carry tunes and are doomed to go through life embarrassed by the fact that they cannot sing or perhaps even recognize our national anthem--a serious disability in these days of political witch-hunting. The follower of common sense typically accepts the fatalistic genetics of earlier decades and does nothing about the matter. To him the monotone appears to have an inherent anatomical defect. But luckily there are psychologists and music educators who check on common sense. They have shown that most, if not all, monotones have psychological rather than biological disabilities and can be helped to overcome their tune weakness. Monotones are often people who have met with emotional difficulties in the early grades of school. Possessed of more than average dislike of the schoolroom or of the music teacher, or of both, and quite frequently holding to the attitude that singing is an activity for sissies, monotones may become uncooperative during the early period when music fundamentals are usually most easily learned. Later in life they will find that with great effort they can master the concept of pitch but that they must have considerable aid from psychologists or music educators to do so.

The situation is probably not different in other domains of learning. One can summarize from the literature pertaining to the areas of human communication that experience and common sense have not added needed information about specific learning problems.

Contrasting information exists relative to the effectiveness of the aural or visual presentation of learning materials. Since a considerable amount of instructional material is based on either a visual or an aural presentation, the need to research the effects of each method for possible clarification and understanding seems evident. There is a fundamental need to improve instruction related to communication.

There are other problems. One is that of determining the effects of different response modes to aural or visual stimulus presentation. A second problem is that of investigating the different methods of aural or visual stimulus presentation and written or voiced response with different kinds of material to be learned. Past research suggests that the stimulus material is an important variable. All of these considerations justify the research effort undertaken in this project, since much human learning seems to be dependent upon accurate perception of, and accurate responses to, a quantity of aural and visual stimuli.

Superimposed upon these problems is the need to analyze the steps and organize materials related to the elemental parts and basic skills necessary for music learning. This analysis provides several categories: (1) the definition of the smallest units of pitch and rhythm suitable for study, (2) the organization of the materials in frames or steps of information, (3) the appropriate display and presentation for each different method, (4) the kind of student responses, (5) the kind of reinforcement, and (6) the collection of student response data.

Since traditional music instruction in schools of music normally deals with basic music elements, functions (1) and (2) could be effectively accomplished. Music stimuli can be manipulated so that function (3) could be realized with minimal difficulty. Functions (4), (5), and (6) had been established as standard operating procedure from previous research. It is possible to prepare different kinds of music materials so that they may be presented either visually or aurally, and students can make either written or voice responses.

In summary, the issues are whether there is a difference in learning with either aural or visual presentation or different kinds of basic music materials, and whether or not the way in which students make a response is an important variable. This report will provide evidence on these issues based on research work with groups of students who have similar characteristics and who were taught by means of self-instructional music materials.

Research Strategy

The attack on the problem being reported involved a basic strategy. An explanation of this strategy will help the reader understand the problems, methods, and results.

This project had the advantage of being able to use the Audio-Visual Training Laboratory, located in The Ohio State University School of Music, which was committed almost entirely to this work. It was possible to conduct the instructional portion of the study as part of the regular academic instruction. This type of contextual research is sometimes difficult to achieve, but desirable since it places the student work in a realistic setting. The advantages are: (1) there is less chance of unusual motivation problems, and (2) there is a better opportunity to have suitable student subjects both in number and in characteristics.

The work of this project was directed toward the development of the skills of music reading and the aural perception of sound. Four modes of self-presentation materials were designed, involving two different kinds of stimuli and two different kinds of responses. In addition to obtaining information from a comparison of the four basic treatments, each treatment was studied individually.

The strategy employed the development of each succeeding step based on one, or a combination, of the following:

(a) experimental research previously completed in music at The Ohio State University,

(b) related research from other fields, and

(c) a review of past research where no recent basic experimental research had been done.

As a result of this plan, materials were analyzed, evaluated, and reconstructed. In so doing, it was possible to implement the techniques needed for carrying out the project.

The research work related to this project was begun, and continued in the following steps:

(a) a review of related research;

(b) an item analysis of tests and student worksheets of the self-presentation materials used for teaching and research during Fall, 1961, in the freshman music fundamentals course of The Ohio State University School of Music;

(c) a statistical analysis of the data obtained from the use of the self-presentation methods;

(d) test development;

(e) an analysis and revision of tests previously used;

(f) revision of self-presentation materials;

(g) construction and redesign of the self-presentation materials to maintain equivalent presentation between the different treatments;

(h) preparation of the experimental recorded versions controlling specific variables;

(i) use of the newly designed and revised self-presentation materials, on an individual pilot basis, to determine the need for further revision before use by the students; and

(j) scheduled training so that only one basic music element was presented during each of three ten-week training periods.

Training in the perception of the relationship between two different tones (music intervals) was experiment 1, training in the perception of units of time (rhythm) was experiment 2, and training in the perception of a combination of two intervals and a rhythm (tone groups) was experiment 3.

Summary

The research reported here was designed to compare the effectiveness of learning resulting from the aural self-presentation of music elements, with either written or voice responses, against the effectiveness of learning resulting from the visual self-presentation of music elements, with either written or voice responses. Specifically the training modes were as follows:

1. aural presentation with written responses,
2. visual presentation with voiced responses,
3. aural presentation with voiced responses, and
4. visual presentation with written responses.

Special programs were written which offered instruction in three different music elements. This information was specially adapted for presentation on magnetic tape so that it could be used in the audio-visual training laboratory. The three experiments will be described in the order in which they occurred.

PART II

A DESCRIPTION OF THE MATERIALS, METHODS, EQUIPMENT, AND POPULATION

The Instructional Materials Used in the Study

Traditionally higher-education music curricula have had courses of instruction entitled "Music Theory," "The Fundamentals of Music," or some other synonymous title (Spohn, 1959). The instruction given in these courses had been aimed toward the development of skills related to the aural and visual perception of music. The content of these courses does not vary from institution to institution, except in sequence and/or method. There are basic skills and knowledge which remain constant throughout the domain of music instruction, and which are as fundamental and rudimentary in the instruction of music as "two plus two are four" in arithmetic; or "Yo hablo Español" means "I speak Spanish."

Music Intervals

One of these basic elements, traditionally presented both visually and aurally, is a music interval, that is, the relationship between two different fixed tones. The relationships that exist remain constant and have characteristic sounds and fixed names. Such a relationship exists between two tones sounded alternately, starting with the lower tone and followed by the upper tone (ascending melodic), or starting with the sounding of the upper tone and followed by the lower tone (descending melodic), or by sounding both tones simultaneously (harmonic). Each one of these possibilities is treated as a separate learning task in traditional music instruction. Data pertaining to the training and tests reported in this study, however, are limited to the ascending melodic form of music intervals. There are twelve basic intervalic combinations within the pattern of a major scale. Figure 1 shows a list of intervals and their symbolic indication, from the smallest to the largest interval found in one octave of a major scale.

Interval Name	Symbolic Indication
Minor Second	m2
Major Second	M2
Minor Third	m3
Major Third	M3
Perfect Fourth	P4
Tritone	T
Perfect Fifth	P5
Minor Sixth	m6
Major Sixth	M6
Minor Seventh	m7
Major Seventh	M7
Perfect Octave	P8

Fig. 1. Music Intervals and Their Symbolic Names

The notational representation is shown in Fig. 2 using the same order, the smallest to the largest.

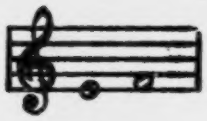
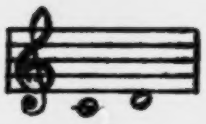
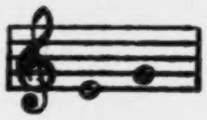
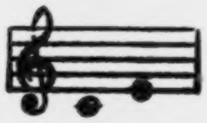
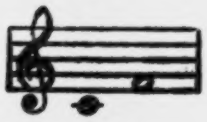
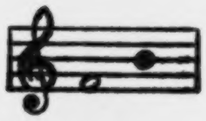
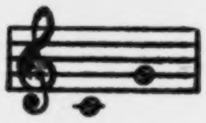
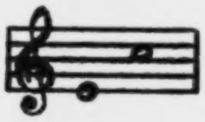
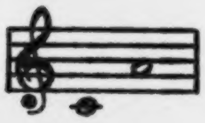
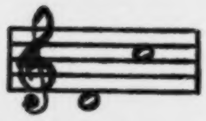
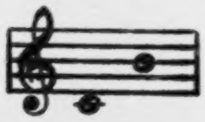
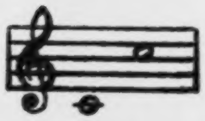
Interval Name	Notational Representation
Minor Second	
Major Second	
Minor Third	
Major Third	
Perfect Fourth	
Tritone	
Perfect Fifth	
Minor Sixth	
Major Sixth	
Minor Seventh	
Major Seventh	
Perfect Octave	

Fig. 2. Music Intervals and Their Notational Representation

Music students must learn to associate the name of the interval with (1) the correct sound, (2) the symbolic indication, and (3) the notational representation. This element of music has been well established as an instructional problem (Ortman, 1934 and Poland, 1960).

A study in the aural instruction of this element (Spohn, 1962) provided an opportunity to investigate the difficulty of perceiving different intervals. An item analysis of written student responses on pretests and posttests showed an order of difficulty. The study was replicated in the fall of 1961, and the pattern of pretest responses confirmed the order of difficulty of the different intervals. That item analysis is presented in Table I. The rank order of difficulty (most easy to most difficult) based on this analysis is as follows:

Interval Name	Rank Order (easy to difficult)
Perfect 8	1
Major 2	2
minor 2	3
Major 3	4.5
Perfect 4	4.5
Perfect 5	6
Major 6	7
Major 7	8
minor 3	9
Tritone	10
minor 7	11
minor 6	12

This analysis also indicated that students confused certain intervals with each other. For example, the minor second was most often confused with major second. The perfect fourth was confused with the major third, tritone, and perfect fifth, etc. The intervals were grouped on the basis of these data into three levels of difficulty as follows:

Level I -- M2 - P4 - M7 - P8

Level II -- m2 - M3 - T - M6

Level III -- m3 - P5 - m6 - m7

Table I

Ascending Interval Melodic Pretest: Autumn Quarter 1961
Written Response Analysis
Number of Subjects = 83 - Four Classes
Number of Responses = 1992

Aural Stimulus	m2	M2	m3	M3	P4	T	P5	m6	M6	m7	M7	P8
Written Response												
m2	119	12	1			1		1		2		
M2	34	136	12	5	6	2		1	1			
m3	6	7	83	12	9	10	2		2		1	
M3	6	5	41	119	10	4	4	1	2	1	1	1
P4		2	8	6	108	7	8	6	8	4	1	1
T	1		3	2	10	69	3	21	6	24	5	1
P5		1	8	6	12	24	102	17	24	12	9	5
m6			2		3	11		42	1	25	15	
M6			1	3	2	8	14	24	100	22	7	5
m7			1			5	2	18	4	44	18	
M7				4	1	8	4	15	8	16	86	1
P8			1	1			24	7	4	1	6	149
Nonsense		2	3	7	4	11	3	10	4	9	12	3
Unanswered		1	2	1	1	6		3	2	6	5	

The programs were based on these three levels, and each program contained 48 items. Five equivalent programs were written for each level of difficulty. In addition, two programs involving a two-way grouping of the intervals were written:

Level IV -- m2 - M2 - P4 - M7 - P8

Level V -- m3 - T - P5 - M6 - m7

Five programs were also written containing all of the twelve intervals as a final training task:

Level VI -- m2 - M2 - m3 - M3 - P4 - T - P5 -
m6 - M6 - m7 - M7 - P8

The six levels represent progressive steps. Examples of these may be seen in Appendix A. The procedure for the use of this material will be explained later (page 22).

Rhythm

For the purpose of this study, rhythm is defined as regular occurring units of time or pulses. Musicians, psychologists, English authorities, speech teachers, and foreign language instructors are cognizant of the rhythmic element. Rhythm in music is fundamental. Psychologists have given considerable attention to the study of rhythm and time perceptions. Verbal material is dependent upon a concept of rhythm.

A little-known thesis from the State University of Iowa (Williams, 1916), provided an excellent historical source of early thinking about rhythm. The literature contains numerous studies dealing with a variety of rhythmic problems which include: kinaesthetic perception of rhythms (Ruckmick, 1913), the perception of filled and unfilled time (Swift and McGeoch, 1925), the impression of temporal intervals (Anderson, 1936), the problems of rhythmic patterns (Ortmann, 1934), experience in rhythm (Ruckmick, 1945), and the reading of rhythm notation (Christ, 1954). One would think that the elemental concept of rhythm would be well defined and thoroughly organized; however, a survey of the research about rhythm does not reveal an organized concept of rhythm. Early research provided no constructive information. There are no organized elemental patterns, comparable to the combination of tones, that are universally accepted. It was, therefore, necessary to define the smallest units of rhythm which could be identified and used for instruction.

In music, pulses or units of time become fixed and are referred to as a beat. Music notation is very flexible as to the symbols which may be used to indicate a beat. A survey of music rhythmic notation revealed that rhythm in music used for instructional purposes was based largely on the symbolic representation; a quarter note (♩) equals the basic pulse. The quarter note as the basic unit serves as an excellent reference point. Any patterns constructed with this base may be altered by augmenting or diminishing the notational value of the basic beat. The basic beat can be divided into multiples of two or three. There are other possibilities, however, which are not common in present instructional materials and therefore were not included in the rhythmic configurations used in this study.

Figure 3 shows how the quarter note can be divided into common and usable duple and triple rhythmic patterns.

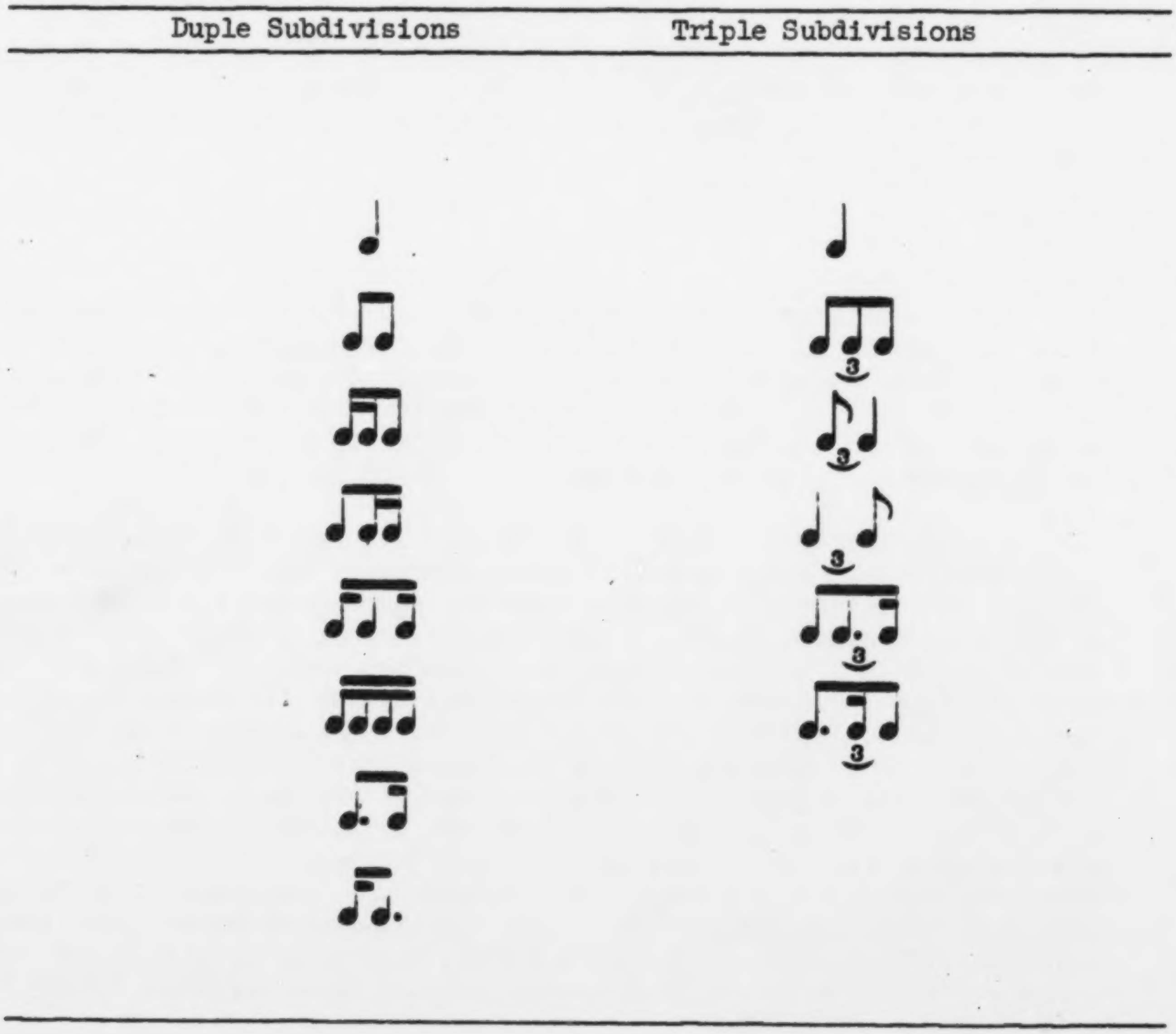


Fig. 3. Rhythmic Subdivisions the Quarter Note

Pilot studies showed that the presentation of these different rhythmic patterns out of any context was impractical for the purpose of this study. The pilot studies also showed that the perception of regular-occurring quarter notes was a simple task for even untrained people. A contextual pattern was constructed and contained the equivalent amount of time represented by three quarter notes, at the rate of 1 per second. The rhythmic manipulation of a beat was designed to occur on either the first or second beat, or on a combination of the first and second beat. There was never a manipulation of the third beat in any of the test items or instructional materials; the third beat always remained a quarter note.

It was possible to write programs and structure levels of progress similar to the interval programs. The levels are shown in Fig. 4.

Level 1 ♩ Rhythm ♩

Level 2 Rhythm ♩ ♩

Level 3 ♩ Rhythm ♩ or Rhythm ♩ ♩

Level 4 Rhythm = Rhythm ♩

Level 5 Rhythm + Rhythm ♩

Examples of these excercises may be seen in Appendix C

Fig. 4. Graded Three-Beat Rhythmic Patterns Used in the Study

Tone Groups

Two basic elements of music have been discussed. Tone combinations were described in their simplest form as intervals. Rhythm was structured as a short unit of three beats. By combining a series of two intervals with a rhythmic pattern it is possible to form a unit of music which will be referred to as a tone group.

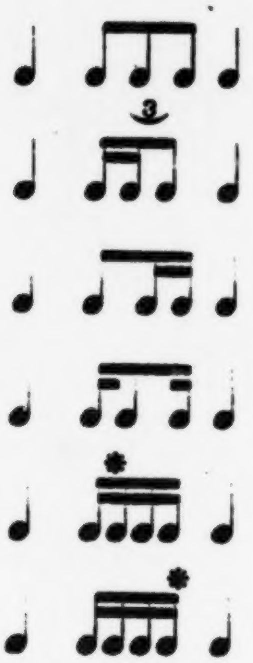
The basic intervals and rhythms are analogous to letters in verbal communication. These may be combined in a variety of ways to form units of music which might be compared with a word. There are twelve different intervals; therefore, it was possible to have 144 combinations of two intervals. This quantity of material was considered too large to cover in the time alloted to this study.

It was considered practical, due to traditional practice, to limit the number of intervals to be used in the combinations to the six smaller intervals, permitting thirty-six workable combinations. Figure 5 shows the combinations.

Second Interval	m2	M2	m3	M3	P4	T
First Interval m2						
M2						
m3						
M3						
P4						
T						

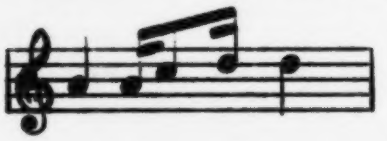
Fig. 5. The Interval Combinations Used to Form Tone Groups

The six rhythm patterns combined with these 36 interval groups were:



*reiterated note

This gave a possibility of 216 tone group patterns. The intervals always occurred during the second beat of the rhythmic pattern

(e.g., ). The tone group material used in

this study may be seen in Appendix E.

Method of Presenting Information

Past research (Spohn, 1959 and 1962) had established an effective procedure in organizing the different self-presentation methods so comparisons could be made. The procedure was adapted from research reported by Keller (1943). The method is a modification of paired associate and regular reinforcement procedures; specifically it involved the procedure of (1) stimulus presentation, (2) a short pause for the student to respond, (3) an identification of the stimulus, and (4) report of the stimulus. An outline of the procedural and time equalizations of the different treatments may be seen in Figs. 6 and 7.

TREATMENT 1

Information given to the student	Aural stimulus		Answer given		Stimulus repeated
Student activity		Writes response on paper		Checks	

TREATMENT 2

Information given to the student	Aural stimulus		Answer given		Look at stimulus
Student activity		Records voice response on tape		Checks	

TREATMENT 3

Information given to the student	Aural stimulus		Answer given		Stimulus repeated
Student activity		Records voice response on tape		Checks	

TREATMENT 4

Information given to the student	Aural stimulus		Answer given		Look at stimulus
Student activity		Writes response on paper		Checks	

Fig. 6. Procedural Equalization of the Four Treatments

Fig. 7. Time-Per-Item Equalization of The Four Experimental Treatments

Treatment 1	**Row A No. 1 - 1 2 3 4**	**1 2**	**1 2 3 4**	**1 2 3 4**	**1 2**
Total time: 16 counts at the rate of 72 counts per second	**Sound stimulus**	**Answer now**	**Written response**	**Answer given and stimulus repeated**	**No. 2**
Treatment 2	**Row A No. 1 - 1 2 3 4**	**1 2**	**1 2 3 4**	**1 2 3 4**	**1 2**
Total time: 16 counts at the rate of 72 counts per second	**Sound pitch reference & student looks**	**Sing and identify**	Voice response	**Stimulus identified and sounded**	**No. 2**
Treatment 3	**Row A No. 1 - 1 2 3 4**	**1 2**	**1 2 3 4**	**1 2 3 4**	**1 2**
Total time: 16 counts at the rate of 72 counts per second	**Sound stimulus**	**Sing and identify**	Voice response	**Stimulus identified and sounded**	**No. 2**
Treatment 4	**Row A No. 1 - 1 2 3 4**	**1 2**	**1 2 3 4**	**1 2 3 4**	**1 2**
Total time: 16 counts at the rate of 72 counts per second	**Student looks**	**Answer now**	**Written response**	**Answer given and stimulus repeated**	**No. 2**

Facilities and Apparatus

Instruction in the various areas of communication has changed in recent years. In particular, research in speech and foreign language has placed different emphasis on learning procedures than those procedures which have been traditionally used in the classroom. Speaking and understanding are presently considered primary objective in acquiring competency in language learning. Hayes (1963) spoke of language learning which involved understanding and speaking as a matter of habits acquired through practice. He then stated, "Learning a foreign language in this respect is much like learning to play a musical instrument." The statement might be simplified by saying learning music rather than musical instrument. Hayes continued with the analogy:

> Both musical and language improvisation are, however, tightly bound to sounds and constructions to which members of the same cultural community can successfully react, and without firm control of these sounds and these constructions, the improvisation will be chaotic, and the "message" will not be understood. The composer, and the poet, exploit this firm control to experiment with new arrangements to convey both familiar and unfamiliar meanings.
>
> Practice is, then, essential to understanding and speaking a foreign language. A competent teacher, who makes the best possible use of classroom time, and has access to good materials, can, indeed, successfully provide the kind of practice required. But it is difficult, often exhausting, for a live teacher to provide throughout countless repetitions, the consistently authentic model and the carefully sequenced progression of drills which efficient practice requires. To provide this practice is the fundamental role of the language laboratory.

Student Use of Equipment and Materials

The facilities were available to the students under procedures similar to those used in libraries; students were able to use the self-presentation materials with a flexible schedule in a supervised situation.

Each experimental treatment group of students had the same amount of work assigned them. The material was graded in terms of difficulty. Taped-lesson Number 10 was the easiest (taped-lesson 11 was equivalent to taped-lesson 10); taped-lesson 100 was the most difficult. Students progressed at their own rate.

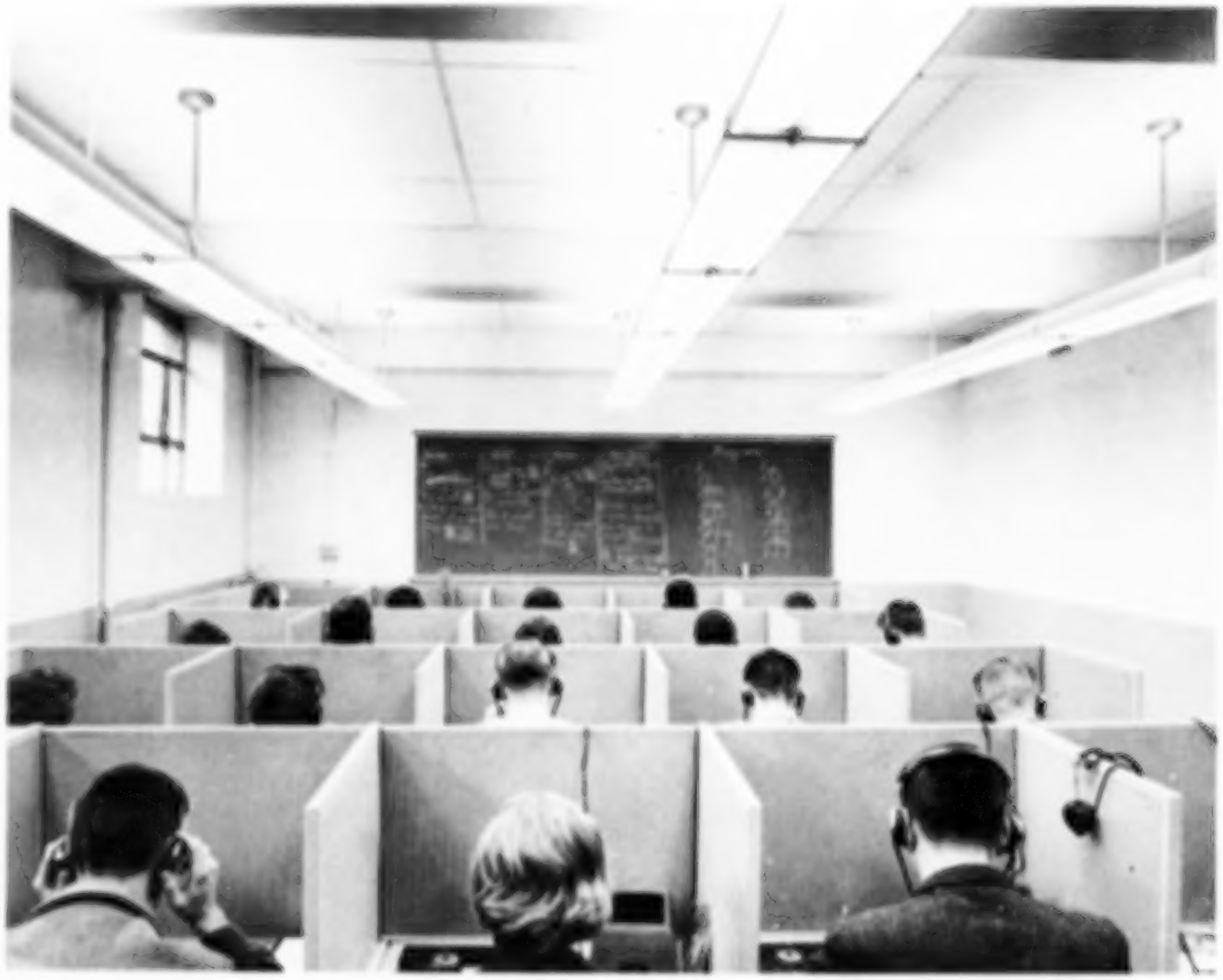


Fig. 8. The Ohio State University School of Music Audio-Visual Training Laboratory provided practical training with self-presentation materials, as well as a laboratory situation for learning research. The procedures previously described have been developed and used at The Ohio State University School of Music for the self-presentation of the elemental materials of music. These methods were similar to those used for teaching foreign language and could be used for foreign language instruction.

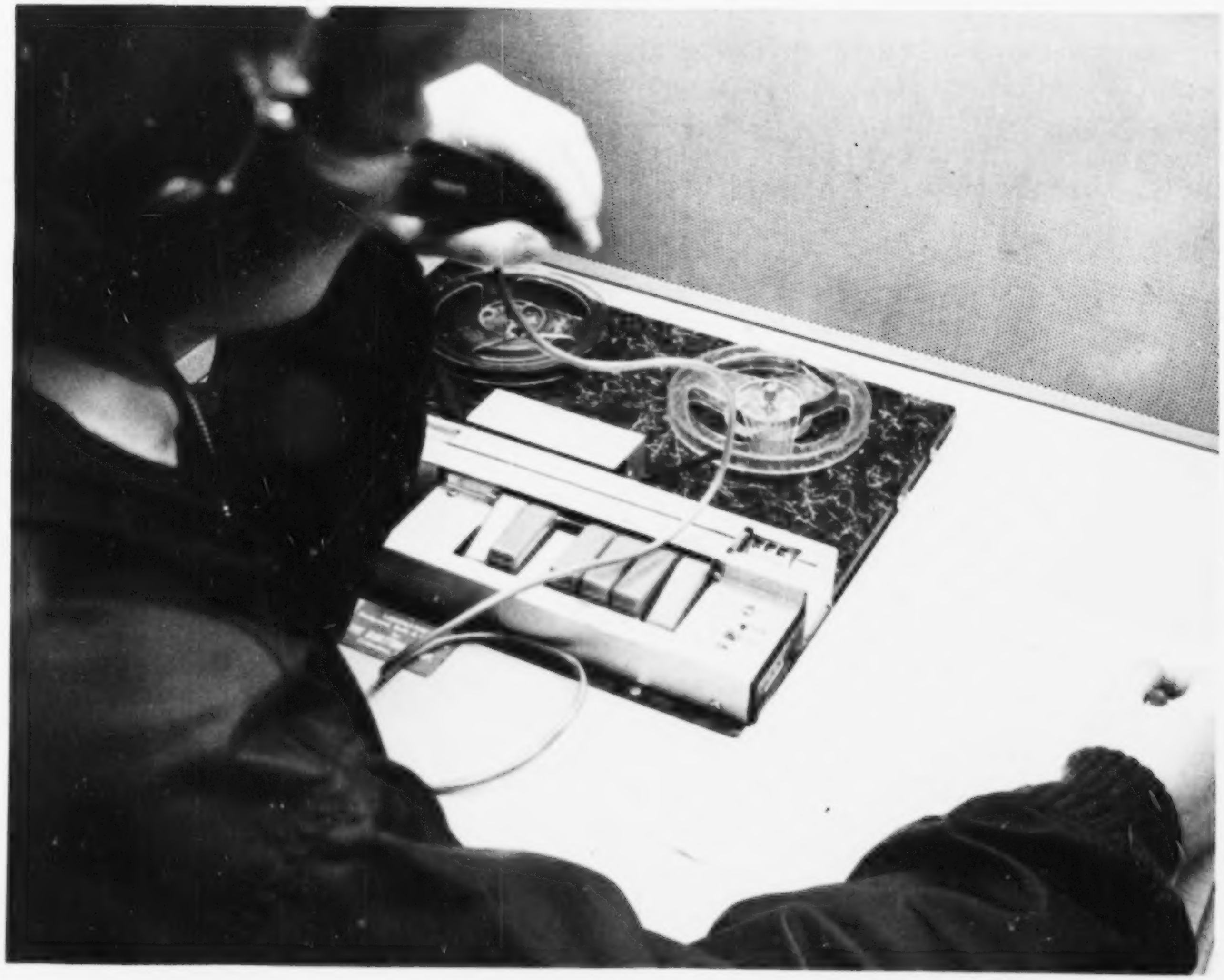


Fig. 9. Some students were given visual stimuli and made voice-recorded responses. The music audio-visual training laboratory used for this study is similar to those used for language instruction.

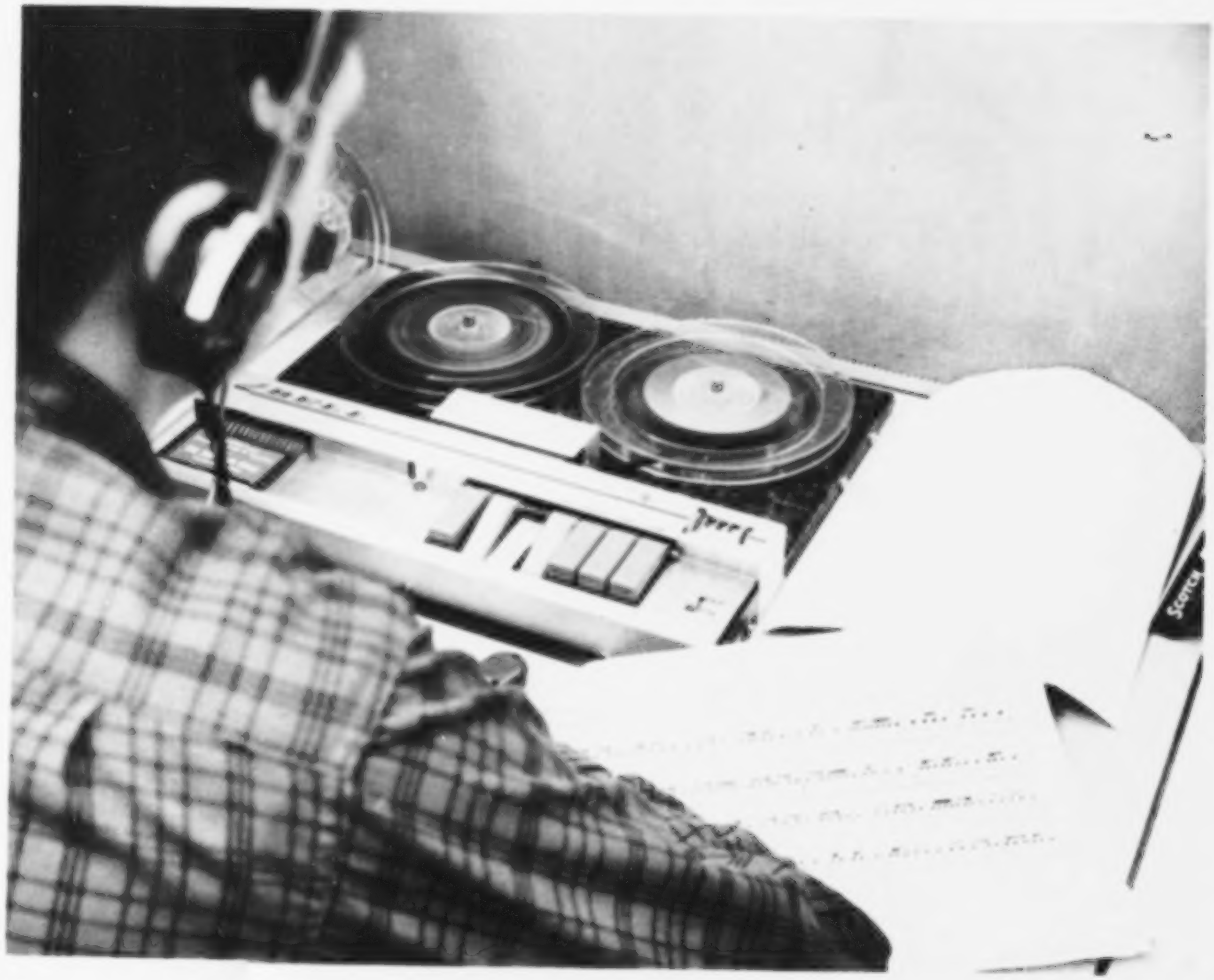


Fig. 10. Some students responded to the tape-recorded material by writing their answers. Each booth contained a dual channel recorder so that students could use the specially prepared materials on an individual basis.

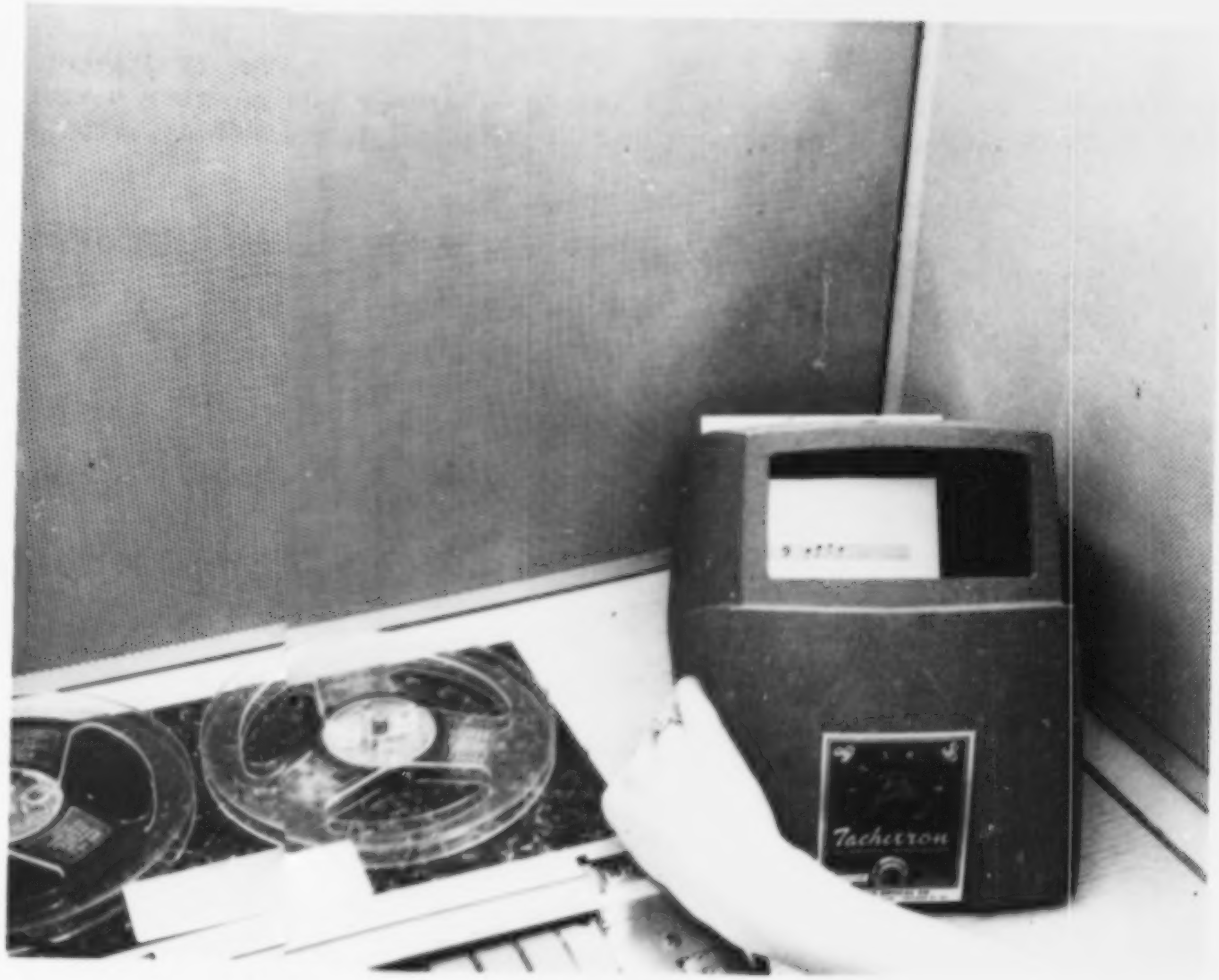


Fig. 11. The tachitron was a valuable instrument in providing a means of presenting visual stimuli to students. Ten tachitrons were added for the visual presentation-written response treatment for the rhythm and tone-group training.

The procedure for the use of the taped self-presentation material was as follows: All students started with the easiest lesson, and were instructed to respond to all items. If a student did not respond to an item it was counted as an error. If more than two errors were made on a lesson, that lesson had to be repeated before going to the next level of difficulty. Each lesson was practiced until the criterion level was reached. An equivalent tape was given for any taped-lesson that was repeated. The score on any tape had to be at the criterion level the first time before the student proceeded to the next level of difficulty.

EXAMPLE

Student X
Criterion Level
30 out of a possible 32

Tape No.	Trial	Score
10	1	26
10	2	28
10	3	32
11 (equivalent to 10)	1	28
11	2	32
12	1	32
20 (next level)	1	etc.

Student Y
Criterion Level
30 out of a possible 32

Tape No.	Trial	Score
10	1	24
10	2	31
11 (equivalent to 10)	1	32
20 (next level)	1	etc.

Student Z
Criterion Level
30 out of a possible 32

Tape No.	Trial	Score
10	1	32
20 (next level)	1	etc.

Entrance and Diagnostic Tests

Information routinely obtained on all students admitted as freshman in the School of Music was used in this project. This information may be divided into two parts, (1) background information and (2) School of Music Entrance Test Scores.

1. Background Information
   a. Age (as of date of acceptance, in years)
   b. Number of years of applied music study
   c. Number of years of piano study

   d. Whether Music Theory had been studied in the high school program

   e. Sex

2. School of Music Entrance Tests

   a. Tests used to determine admission to the School of Music

      (1) An audition in the proposed area of performance. Scoring is on a 5 point scale (0 = E, 1 = D, 2 = C, 3 = B, 4 = A)

      (2) The Ohio State Psychological Examination. The score used is the total percentile based on The Ohio State University Freshman Norms.

      (3) The Ohio State Music Placement Test Battery. This Battery is in three parts, each part containing 50 questions. The complete battery samples 13 different categories of musical skill and information (Poland, 1960a). Section I Form VI, Aural and Notational Skills, contains the following parts:

         (1) Rhythmic Patterns

         (2) Melodic Patterns

         (3) Notational Errors

         (4) Melodic Dictation

         (5) Scale Notation

         (6) Interval Dictation

         (7) Interval Notation

         Section II Form II A, Music Recognition, requires the aural recognition of compositions by:

         (1) Composer

         (2) Title

Section III Form IV A, General Musical Information, measures students' knowledge of:

(1) Composers

(2) Music

(3) Musical Personalities

(4) Technical Terms

Sections I and II are completely controlled by pre-recorded tape. Section III is in standard multiple choice form.

b. The Ohio State Diagnostic Test Battery, Elements of Music Theory, Section I Form II, administered after admission to the School of Music. This is a pre-recorded test designed to measure certain responses to the elemental categories of intervals, scales, and chords presented in aural or visual forms (Poland, 1960b).

In each category scores are obtained on the Speed of Notation, Accuracy of Notation, Output (which is the product of the Speed and Accuracy Scores), Aural Recognition, and Visual Recognition. Weighted scores in each category may be added to obtain overall measures of Speed, Accuracy, Output, Aural Recognition, and Visual Recognition. This test is used throughout the undergraduate and graduate program in the School of Music to assess achievement.

The Diagnostic Test (2b) was used in this project for separate measures of overall speed and accuracy of notational, aural, and visual abilities. That this test gives relatively independent measures of these abilities, and that all of these abilities are significantly related to grades in the fundamentals of music courses have been demonstrated (Poland, 1960, 1963). The particular pattern of correlations of test scores for the 71 students used in this project is given below:

Table II

Product-Moment Coefficients of Correlation (r) and Multiple Correlation (R) of Elements of Music Theory Total Scores with First Quarter Fundamentals of Music Grades for the Students (N = 71) Used in This Project

	Notation Accuracy	Notation Output	Aural Recognition	Visual Recognition	First Quarter Fundamentals of Music Grade
Notation Speed	.35	.79	.34	.36	.37
Notation Accuracy		.82	.48	.43	.61
Notation Output			.52	.46	.60
Aural Recognition				.27	.54
Visual Recognition					.50

R = .72

Correlations significant at the 1% level are underlined

The Use of the Test Battery at The Ohio State University School of Music

Background information (1) and Test Scores (2a) are used in various combinations for selection and placement purposes in the freshman fundamentals of music class. Admission to the School of Music as a Major, or to the first quarter course in the Fundamentals of Music as an elective, is by means of a satisfactory prediction for the 6th quarter point-hour ratio. The total percentile score of the Ohio State Psychological Examination and the total scores from the three sections of the Music Placement Test Battery are used in a regression equation to predict grades in the first quarter Fundamentals of Music course. Scores on the Ohio State Psychological Examination, the three sections of The Ohio State University School of Music Placement Test Battery, and sex are used in conjunction with the Audition grade to determine freshman admission to the School of Music.

The power of this procedure is indicated by the following: The multiple correlation (R) of music Placement Test Battery Sections I, II, and III; Ohio State Psychological Examination scores; and sex with total university grade point-hour ratio at the end of six quarters of study for 165 freshman music majors entering 1956-1957 is .65. The regression equation used for admission decisions in the 1962 class is based on this sample. The correlation, (r), of predicted and actual six-quarter total university grade point-hour ratio for 252 freshman music majors entering 1958, 1959, and 1960 is .69.

The multiple correlation, (R), of Music Placement Test Sections I, II, and III; and Ohio State Psychological Examination scores with first quarter freshman Fundamental of Music grades for 91 freshman music majors entering 1958 is .83. The regression equation used for placing the 1962 class of freshman Fundamentals of Music is based on this sample.

Table III

Product-Moment Coefficients of Correlation (r) and Multiple Correlation (R) Music Placement Test Battery Sections I, II, III and The Ohio State Psychological Examination with First Quarter Freshman Fundamentals of Music Grades for the Students (N = 71) Used in This Project

	Music Placement Test Battery			First Quarter Fundamentals of Music Grade
	II	III	OSPE	
Music Placement Test Battery				
I	.39	.28	.31	.59
II		.75	.46	.50
III			.30	.35
OSPE				.65

R = .77

Correlations significant at the 1% level are underlined

The correlation, (r), between predicted and actual first quarter freshman Fundamentals of Music grades for this group is .72. It may be seen that the predictive control available through the School of Music testing program is extremely consistent and high.

Experimental Groups

One hundred and five (105) students were admitted to the first course in Fundamentals of Music in the Fall, 1962. This group of students was considered to be a representative sample of freshman classes in the School of Music. In this, as in other professional schools, standards are gradually rising; however, records extending back to 1956 permit covariance analysis to take this gradual rise into account where it is appropriate. A comparison of the 1961 and 1962 classes is given as follows:

Table IV

Summary of Analyses of Variance of Predicted First Quarter Freshman Fundamentals of Music Grades and Predicted Sixth Quarter Total University Grade Average for 205 Students in the 1961 and 1962 Freshman Classes in the Fundamentals of Music

	1961 Mean	1962 Mean	$F_{(1,204)}$
Predicted first quarter freshman Fundamentals of Music grade	2.64	2.76	.61
Predicted 6th quarter total university grade average	2.45	2.54	2.32

(with 1 and ∞ degrees of freedom $F_{(.05)} = 3.84$)

The assumption of representativeness holds for the purpose of this project.

Procedure for Equating Fundamentals of Music Classes

Freshman courses in the Fundamentals of Music are taught in four sections by three different teachers. Students are regularly assigned to sections of the first quarter course so that sections are equated for size and predicted sixth-quarter total university grade average. Given these conditions, classes are balanced as nearly as possible for sex and applied music field. Schedule problems make perfect balancing impossible. The 1962 class was grouped as follows:

Section	1	2	3	4
Teacher	1	2	3	3
Number of Males	13	11	10	15
Number of Females	14	15	16	11
Total	27	26	26	26

Evidence that these groups are, in fact, equivalent is given below:

Table V

Summary of Analyses of Variance of Predicted First Quarter Freshman Fundamentals of Music Grades and Predicted Sixth Quarter Total University Grade Average for 105 Students in Four Sections of the First Quarter of Freshman Fundamentals of Music, Fall, 1962

	Mean	Mean	Mean	Mean	$F_{(3,101)}$
Predicted first quarter freshman Fundamentals of Music grade	2.81	2.86	2.54	2.85	1.91
Predicted 6th quarter total university grade average	2.57	2.58	2.49	2.54	.55

(With 3 and 120 degrees of freedom $F_{(.05)} = 2.68$)

It may be said that the four sections of the first quarter of freshman Fundamentals of Music did not differ significantly in terms of the basic criteria for acceptance and sectioning. In this experiment, section and instructor are completely confounded. All analyses take this combined teacher-section effect into account.

Construction of the Experimental Groups

The plan for the construction of experimental groups was essentially that described above, except that experimental groups were equated for predicted first quarter Fundamentals of Music grades. To test the equivalence of these four groups, a two-way analysis of variance, testing for sex and group differences in scores, was carried out. This analysis is summarized in the following:

Table VI

Summary of Analysis of Variance of Predicted First Quarter Fundamentals of Music Grades for 105 Students in Four Fall, 1962, Interval Experiment Treatment Groups

Source					F	
Sex	Male (n = 48)	Female (n = 57)				
Mean	2.78	2.73			.12	(df 1, 97)
Group	A (n = 26)	B (n = 26)	C (n = 27)	D (n = 26)		
Mean	2.66	2.73	2.74	2.88	.34	(df 3, 97)
Interaction Sex x Group					.34	(df 3, 97)

(With 1 and 120 df $F_{(.05)} = 3.92$, with 3 and 120 df $F_{(.05)} = 2.60$)

Having established the essential equivalence of the four groups in these terms, the four groups were randomly assigned to experimental treatments for experiment 1.

Group	Number	Experimental Treatment Assignment
A	26	3
B	26	2
C	27	4
D	26	1

Since this study, including three different experiments, was carried on as part of the required course sequence in Fundamentals of Music, it was important that training opportunities be equalized as nearly as possible. In sequential experiments it is necessary that the effects of prior experimental treatments be controlled.

By use of a hyper-Graeco-Latin square (Lindquist, 1953) it was possible to satisfy these two conditions in the sense that no student spent more than one part of the project in a given experimental treatment mode, and that the effects of previous training were balanced in each subsequent experimental group.

Unpredictable attrition makes the prior determination of final group sizes impossible. It is known that most of the attrition in the freshman course sequence in the Fundamentals of Music takes place by the beginning of the second quarter. The hyper-Graeco-Latin square group assignments were made, then, on the 78 students who enrolled for the second quarter of freshman Fundamentals of Music.

Between the time experimental groups for the Winter and Spring experiments were set up, and the completion of the Spring experiment, normal academic attrition further reduced the total number of students from 78 to 71; the 71 students completed all three parts of this experiment. The group sizes for the three experiments were thus:

Experimental Treatment	1	2	3	4	N
Intervals	21	17	17	16	71
Rhythm	17	18	19	17	71
Tone Groups	16	17	19	19	71
N	54	52	55	52	

This procedure was begun nine months before, and completed six months before, it was known which particular students would constitute the groups on which the experimental analyses were carried out. It can be seen that the procedure leads to final group sizes which are quite satisfactorily balanced.

The Control Variables

Five items of background information, ten School of Music Test Scores, the appropriate pretest score, and the amount of time spent in experimental treatment were used as statistical controls in all three experiments. Added to these 17 variables as controls in the Winter quarter experiment were the separate grades received in the first quarter courses in the Fundamentals of Music, Freshman English, and Applied Music. In the Spring quarter experiment the accumulated average grades for two quarters of work in these three course sequences were used. Following is a list of these variables, together with their means and standard deviations for the total group of 71 experimental subjects. The combined effect of all of these variables is considered in each analysis of experimental treatments (Tables XIII to XXVIII) under Number 2, "Other Factors." Correlations of these variables with pretest and posttest-pretest difference scores will be found in Tables VII to IX and XXXV to XXXVII.

Background Data	Mean	Standard Deviation
Sex (coded 0 = male, 1 = female)	0.5	.5
Age (as of date of acceptance)	18.4	1.5
Number of years of private study	5.4	3.5
Number of years of piano study	4.2	4.2
Had music theory training in high school (0 = no, 1 = yes)	.5	.5

School of Music Test Scores

Ohio State Music Placement Test Battery	Mean	Standard Deviation
Section I - Form VI Aural and Notational Skills	41.3	5.8
Section II - Form II A Music Recognition	37.1	6.2
Section III - Form IV A General Musical Information	33.2	7.6
Ohio State Diagnostic Music Test Battery Section I - Form II, Elements of Music Theory		
Notational Speed Total	52.8	14.9
Notational Accuracy Total	58.3	18.5
Notational Output (Speed x Accuracy) Total	31.7	16.2
Aural Total	65.0	16.5
Visual Total	46.9	16.7
Entrance Audition (where E = 0, A = 4)	3.1	.8
Ohio State Psychological Examination Total Percentile Score	75.0	21.1
Grades (All grades computed with E = 0, D = 1, C = 2, B = 3, A = 4)		
First Quarter Freshman Music Theory	2.7	1.1
First Quarter Freshman English	2.2	.8
First Quarter Freshman Applied Music	3.3	.7
First Two Quarters Freshman Music Theory	2.7	1.0
First Two Quarters Freshman English	2.2	.7
First Two Quarters Freshman Applied Music	3.3	.6

Time Spent in Experimental Treatments	Mean	Standard Deviation
Fall Experiment	13,046 seconds	8,005 seconds
Winter Experiment	5,730 seconds	2,204 seconds
Spring Experiment	11,104 seconds	6,796 seconds

Pretests for each experiment are described in Part III of this report. Statistical treatment of the pretest scores is given under number 6 of Tables XIII to XXVIII.

PART III

THE THREE EXPERIMENTS

Introduction

Music educators have been involved with teaching the recognition of the various sounds and symbols of music and related problems as part of the music learning process. Many methods have evolved so that students could learn basic materials to a more adequate level. The presentation of these materials has been primarily an aural or visual approach. When students responded to these materials, they normally performed the required tasks by voicing (singing) or by writing their responses. Little has been known as to the learning effectiveness of any of the several possible combinations of material presentation or the response modes. The purpose of this research was to study and compare the effectiveness of students' learning basic music elements with two different self-presentation methods and two different kinds of response modes. Intervals, rhythms, and tone groups were the basic music elements used in this study.

A ten-week period was allotted for the students to learn each one of these three basic elements. Only one of the three basic music elements was learned during each ten-week training period. The students used specially prepared self-presentation materials that were available on a library basis in the music audio-visual training laboratory. This training was in addition to the instruction that took place in their regular Fundamentals of Music class and was considered adjunctive to their classroom work.

The Tests

All students were given the same pretest and posttests at the beginning and end of each ten-week training period. Fall quarter the music element was intervals; Winter quarter, rhythms; Spring quarter, tone groups. The pre- and posttests were representative of the training materials employed in the four different treatments. In each test there were equivalent materials presented in the following manner:

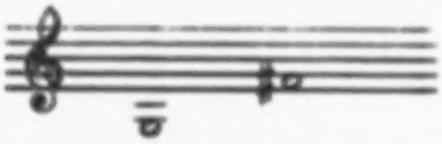
1. Aural Stimulus-Written Response (treatment no. 1)
2. Visual Stimulus-Voice Response (treatment no. 2)
3. Aural Stimulus-Voice Response (treatment no. 3)
4. Visual Stimulus-Written Response (treatment no. 4)

The tests measured the students' level of performance ability on the single kind of training to which they were assigned, as well as the tasks included in the other three treatments.

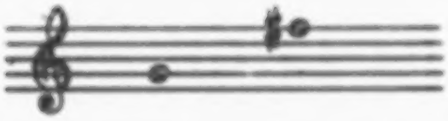
The Interval Tests

The music intervals used in the training material and tests are the 12 intervals listed in Fig. 1. Each test contained all 12 intervals, and each item was given two times in a randomized presentation.

Each section of the interval tests contained 24 intervals. The first 12 were chosen from the pitches in this range:



The second 12 examples were from this range:



By giving the 12 pitches numbers from 1 to 100, the selection of the particular note to be used for each exercise was made by means of the following table and by means of a random number table:

g	00	12	24	36	48	60	72	84	96
g♯	01	13	25	37	49	61	73	85	97
a	02	14	26	38	50	62	74	86	98
b♭	03	15	27	39	51	63	75	87	99
b	04	16	28	40	52	64	76	88	100
c	05	17	29	41	53	65	77	89	
c♯	06	18	30	42	54	66	78	90	
d	07	19	31	43	55	67	79	91	
e♭	08	20	32	44	56	68	80	92	
e	09	21	33	45	57	69	81	93	
f	10	22	34	46	58	70	82	94	
f♯	11	23	35	47	59	71	83	95	

The selection of the particular interval was also done by assigning numbers to the intervals and using the random number table. This may be seen below:

P8	0
M2	1
M7	2
P4	3
etc.	

The complete test material may be seen in Appendix B.

The Rhythm Test

The rhythm test for each of the four treatments included all of the 100 three-beat rhythm patterns used in the training. All of the possible combinations are shown in Figs. 12 and 13. The rhythm patterns were randomized for presentation for each of the four treatments. The test material may be seen in Appendix D.

Figure 12

All of the Duple Rhythm Patterns Used in the Rhythm Tests

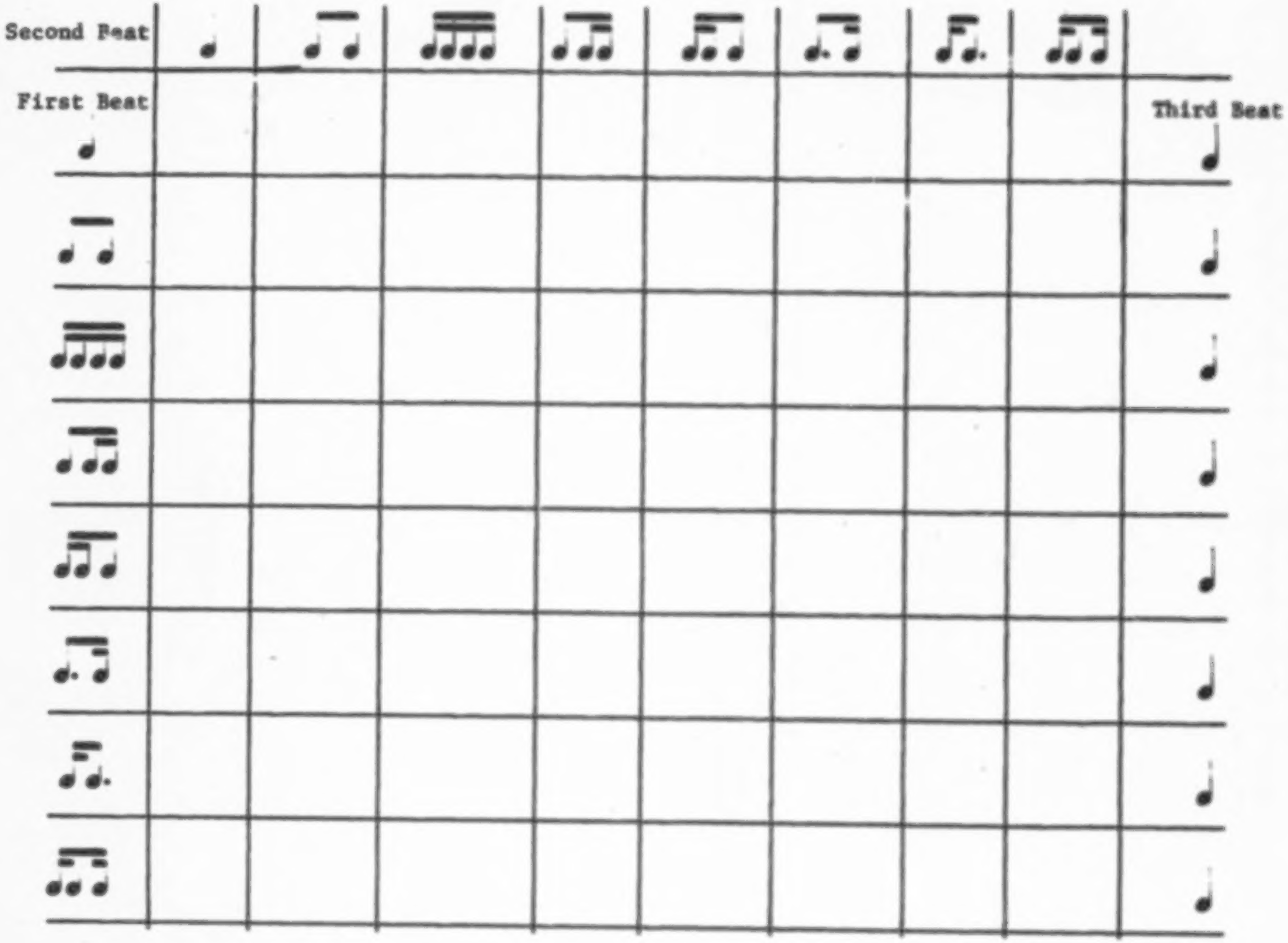
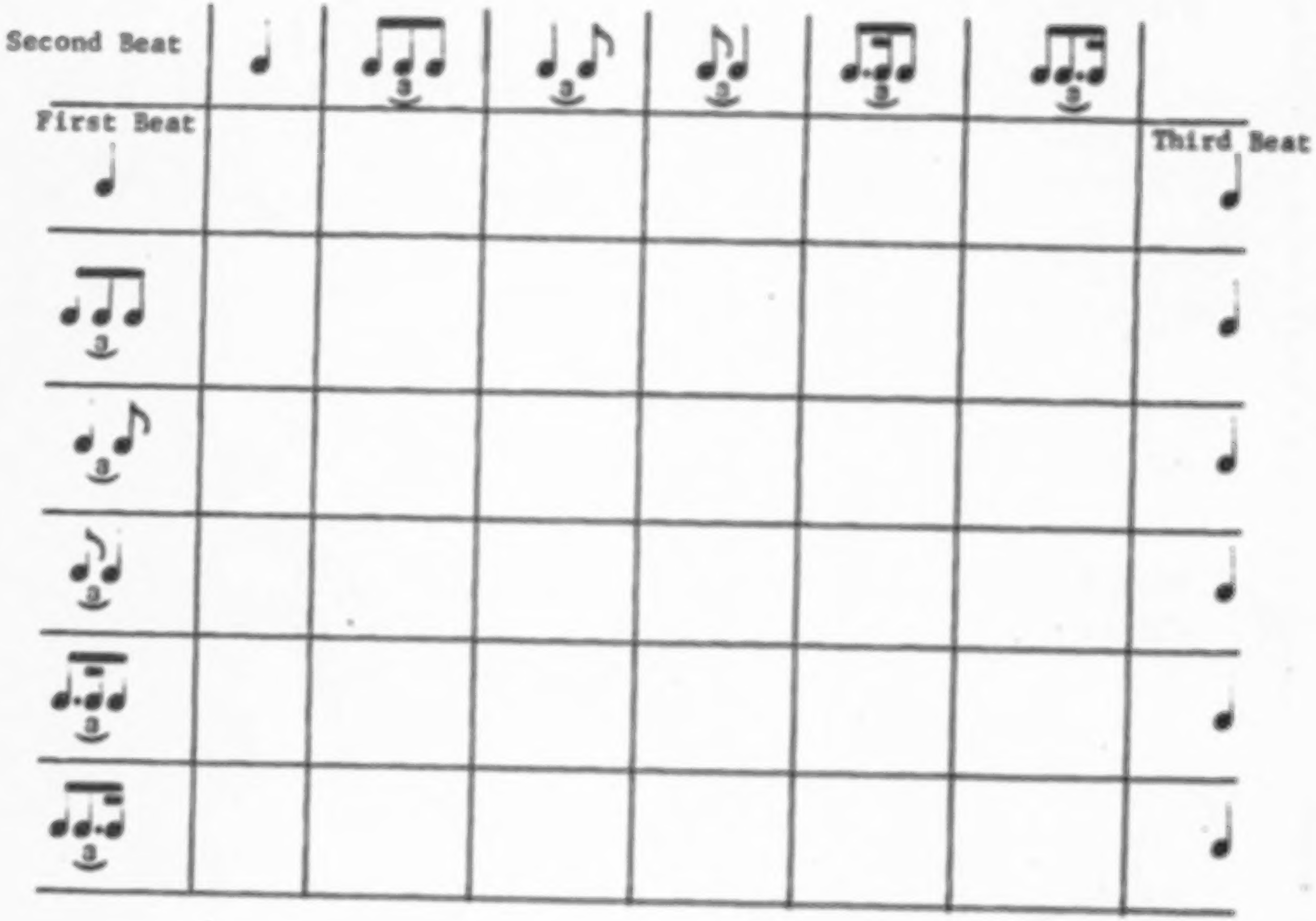

Second Beat
First Beat
Third Beat

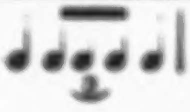
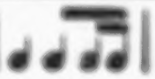
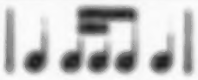
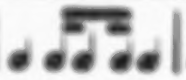
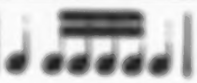
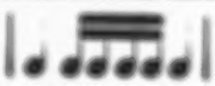
Figure 13

All of the Triple Rhythm Patterns Used in the Rhythm Tests


Second Beat
First Beat
Third Beat

The Tone Group Tests

The items used in the tone group test are shown in Fig. 14.

	1	2	3	4	5	6
Rhythm Pattern						
Interval Combination	m2-m2 M2-T m3-P4 M3-M3 T -M2	m2-M2 M2-m2 M3-T M3-P4 T -m3	m2-m3 M2-M2 m3-m2 M3-T T -M3	m2-M3 M2-m3 m3-M2 M3-m2 T -P4	m2-P4 M2-M3 m3-m3 M3-M2 T -T	m2-T M2-P4 m3-M3 M3-m3 T -m2

* reiterated

Fig. 14. The Tone Groups Used in the Tests

The range employed for the starting pitch was g - f_2 and the following code was used for the pitches (the choice was arbitrary as to which octave, i.e., d_1 or d_2, came first):

g - 1
$g^{\#}$ - 2
a^{b} - 3
a - 4
$a^{\#}$ - 5
b^{b} - 6
b - 7
c_1 - 8
$c^{\#}_1$ - 9

d^{b}_1 - 10
d_1 - 11
$d^{\#}_1$ - 12
e^{b}_1 - 13
e_1 - 14
f_1 - 15
$f^{\#}_1$ - 16
g^{b}_1 - 17
g_1 - 18

Some starting pitches had to be omitted to avoid the use of double flats or sharps. These items were randomized for presentation for each of the four treatments. The test material may be seen in Appendix E.

	EXPERIMENTAL TREATMENT			
	1 Aural Stimulus-Written Response	2 Visual Stimulus-Voice Response	3 Aural Stimulus-Voice Response	4 Visual Stimulus-Written Response
Basic Music Element				
Interval Pretest	D1	D4	D6	D8
Interval Posttest	D11	D14	D16	D18
Duple Rhythm Pretest	E1	E3	E5	E7
Duple Rhythm Posttest	E11	E13	E15	E17
Triple Rhythm Pretest	E2	E4	E6	E8
Triple Rhythm Posttest	E12	E14	E16	E18
Tone Group Pretest	F1	F2	F3	F4
Tone Group Posttest	F11	F12	F13	F14

Fig. 15. The Code for the Experimental Treatment and Basic Music Elements Used for All Tabular Presentations of the Three Experiments

Correlation Tables

Five items of background information, 10 School of Music Test Scores, the amount of time spent in experimental treatment, the appropriate pretest score, and certain course grades were used as statistical controls in these experiments. These are the variables included under "Other Factors" in the Analysis of Variance and Covariance Tables. In these analyses a separate F test might have been made for each of these "factors." However, it is already known (Poland, 1960 a,b; 1963) that most of the "Other Factors" variables are significantly related to each other. Thus, a procedure testing the separate effects would have led to a less precise test of the main effects of the experimental treatments being analyzed.

The separate effects of these variables may be estimated by looking at the coefficients of correlation between the separate variables and individual test scores.

Since this report may be of interest to many unfamiliar with the statistic known as the Product-Moment Coefficient of Correlation, some discussion seems pertinent. A correlation coefficient is a measure of the extent to which the change in one variable is related to a change in another. A correlation, of itself, gives no information, and makes no statement, about causes. If one is willing to make certain assumptions, which we believe to be appropriate but which will not be discussed here (Hoel, 1947; McNemar, 1955), it is possible to square a coefficient of correlation multiply the result by 100, and read the resulting figure as the per cent of interrelationship. A correlation of .31 squared--that is multiplied by itself--is equal to .0961, or 9.61 per cent. The following list equating certain correlation coefficients to per cent of relationship, is given to aid in interpreting the tables of correlations in this report.

r or R	% relationship
± .10	1%
± .20	4%
± .30	9%
± .40	16%
± .50	25%
± .60	36%
± .70	49%
± .80	64%
± .90	81%
± 1.00	100%

At this stage of our knowledge, interrelationships of the order of 10 per cent or less are unimportant, even if they are real. A one per cent significance level gives us a great deal of confidence in the reality of correlations which achieve this level, and for 71 subjects a correlation coefficient of .31, which represents very nearly a 10 per cent relationship, is significant at the one per cent level. Therefore, this one per cent level was chosen for our study of the separate correlation coefficients. In these correlation tables only those Background Variables, School of Music Tests, and Course Grades were included which showed a significant correlation with at least one of the experimental tests in that table. In all of these tables coefficients of correlation significant at the one per cent level are underlined.

Background Variables and the Experiments

Age and sex are variables which might show differential effects in any test of ability or of differences due to experimental treatments. In terms of correlation coefficients no significant relationship was found between sex or age and any pretest or posttest-pretest difference scores.

It would seem most reasonable to expect that the amount of private music study, and in particular of piano study, would make some contribution to the abilities measured by the pretests in these experiments. In fact, there is no evidence of significant relationship between private study of any sort and any pretest or posttest-pretest difference score. This is important because the piano was chosen as the instrument medium for the presentation of stimuli in these experiments. The fact that the amount of private study shows no relationship to experimental test scores does not indicate that the quality of teaching would not have a significant effect. There is, however, no direct way to measure this quality.

The only background variable which does show a significant relationship with experimental test scores is the one concerned with whether there had been any music theory training in the high school program. Relationships are found only in the interval test scores. As may be seen in Tables VII and XXXV, this background variable is significantly related to the two interval pretest scores, which are related to the experimental treatment requiring written responses, and to the interval posttest-pretest difference score, which is related to the experimental treatment with no aural component. It may be concluded that previous musical training, as represented by the amount of private study (of the piano in particular), and exposure to music theory in high schools makes no important contribution to the aural abilities measured in these experimental tests.

Entrance Audition and the Experiments

The entrance audition grade represents an expert judgment of performance ability at the time of entrance. The common assumption is that there are high relationships between the ability to perform music and the tasks related to the learning of the music elements studied in these experiments. There is no evidence of relationship between audition grade and any experimental test. In many cases logically similar tasks are behaviorally dissimilar or unrelated. Much work must be done before it is possible to make practical predictions about the extent and direction of transfer of training. What we can do is act on the information obtained in specific instances. It should not be assumed that performing ability and other abilities calling for different responses to the same elements would necessarily be related.

Relationship between Music Placement, Diagnostic, and Ohio State Psychological Scores with Experimental Pretest and Posttest-Pretest Difference Scores

The tests regularly used in the School of Music testing program were used in this project in order to increase the precision of the test of the main effects of experimental treatments. The relationships are shown in Tables VII-IX and XXXV-XXXVII.

In the School of Music it is routine procedure to use these tests in all relevant investigations because their use forms a common statistical reference base. The correlations, intercorrelations, and multiple correlations, which are by-products of the computer program used in analysis of variance problems, make possible our continued search for both elemental and complexly related musical behaviors. It also provides, through regression analysis, a basis for the selective treatment of individuals in training programs, such as the ones on which these experiments were based.

Although these tests served their intended purpose when included as "Other Factors" in the analysis of experimental treatments, their correlations with pretest and posttest-pretest difference scores are given as a matter of information to those who might wish to pursue the possible implications of these correlations.

2

Table VII

Product-Moment Coefficients of Correlation (r) of Selected Background and School of Music Test Scores with Interval Pretest Scores

Number of Subjects = 71

(coefficients of correlation significant at the 1 per cent level are underlined)

	D1	D4	D6	D8	Mean	Standard Deviation
Music Theory Training in High School	.39	.20	.20	.45	0.5	0.5
Music Placement Test Battery						
Section I, Aural and Notational Skills	.61	.32	.43	.36	41.3	5.8
Section II, Music Recognition	.29	.18	.24	.32	37.1	6.2
Section III, General Musical Information	.35	.12	.29	.41	33.2	7.6
Ohio State Psychological Examination	.32	.16	.22	.39	75.0	21.1
Diagnostic Test Battery Elements of Music Theory Total Scores						
Notation Speed	.40	.25	.18	.49	52.8	14.9
Notation Accuracy	.44	.30	.38	.74	58.3	18.5
Notation Output	.54	.33	.38	.42	31.7	16.2
Aural Recognition	.80	.40	.59	.44	65.0	16.5
Visual Recognition	.22	.19	.14	.53	46.9	16.7
Mean	12.5	6.8	11.0	16.3		
Standard Deviation	5.1	6.3	7.3	4.6		

Table VIII

Product-Moment Coefficients of Correlation (r) of
Selected School of Music Test Scores and First Quarter Course Grades
with Rhythm Pretest Scores
Number of Subjects = 71
(coefficients of correlation significant at the 1 per cent level are underlined)

	E1	E2	E3	E4	E5	E6	E7	E8	Mean	Standard Deviation
Music Placement Test Battery										
Section I, Aural and Notational Skills	.26	.32	.29	.25	.10	.19	.18	.17	41.3	5.8
Section III, General Musical Information	.32	.35	.17	.14	-.02	.04	.31	.22	33.2	7.6
Ohio State Psychological Examination	.50	.44	.28	.33	.19	.06	.13	.24	75.0	21.1
Diagnostic Test Battery Elements of Music Theory Total Scores										
Notation Accuracy	.47	.47	.39	.28	-.04	.08	.18	.05	58.3	18.5
Notation Output	.43	.49	.33	.25	.00	.01	.09	.05	31.7	16.2
Visual Recognition	.24	.33	.34	.27	.12	.10	.22	.11	46.9	16.7
Course Grades										
One Quarter of Freshman Music Theory	.35	.42	.37	.38	.09	.12	.14	.15	2.7	1.1
One Quarter of Private Study	.05	.17	.23	.34	-.10	.06	.31	.10	3.3	0.7
Mean	25.1	10.7	58.7	30.7	57.5	32.0	58.6	32.7		
Standard Deviation	19.2	8.5	8.6	7.7	6.3	4.1	7.1	4.5		

Table IX

Product-Moment Coefficients of Correlation (r)
of Selected School of Music Test Scores and Two-Quarter
Course Grade Averages with Tone-Group Pretest Scores
Number of Subjects = 71
(coefficients of correlation significant at the 1 per cent level are underlined)

	F1	F2	F3	F4	Mean	Standard Deviation
Music Placement Test Battery						
Section I, Aural and Notational Skills	.42	.42	.14	.26	41.3	5.8
Section II, Music Recognition	.32	.11	.02	.30	37.1	6.2
Section III, General Musical Information	.39	.09	-.01	.25	33.2	7.6
Ohio State Psychological Examination	.40	.35	.11	.28	75.0	21.1
Diagnostic Test Battery Elements of Music Theory Total Scores						
Notation Speed	.51	.28	.05	.41	52.8	14.9
Notation Accuracy	.41	.27	.03	.32	58.3	18.5
Notation Output	.62	.35	.07	.42	31.7	16.2
Aural Recognition	.53	.34	.17	.21	65.0	16.5
Visual Recognition	.23	.25	-.08	.34	46.9	16.7
Course Grades						
First Two Quarters Freshman Music Theory	.46	.43	.01	.32	2.7	1.0
First Two Quarters Private Study	.20	.33	.25	.12	3.3	0.6
Mean	1.5	5.2	16.9	19.6		
Standard Deviation	3.2	6.5	9.7	8.2		

Intercorrelations between Pretest Scores

Tables X, XI, and XII, respectively, give pretest intercorrelations for interval pretests, rhythm pretests, and tone group pretests. It is to be expected that significant positive relationships will be found within each of the three sets of pretest scores, for they deal with the same items in different fashions. If the various stimulus-response patterns represented by the several tests in an experiment are as different as we expect them to be, these interrelationships should be relatively small and the upper limit should be an interrelationship of about 50 per cent, represented by a correlation coefficient of about .7. In fact, this is what we find to be the case. All significant correlations are positive and only two of them, both between interval pretests, approach the .7 figure. The high correlations--.76 between E1 and E2, .83 between E3 and E4, and .63 between E5 and E6--represent relationships between pairs of tests, differing only in that the first test of each pair uses a duple division of the beat and the second a triple division. The problem here is, why is the correlation of .40 between E7 and E8 so low? We are not now in a position to answer this question.

It was to be expected that the smallest relationships would be found between the tests having some aural component and those having none. For intervals and tone groups this is precisely what we do find. For the rhythm pretest this needs modification only to the extent of observing that the small significant correlations between the tests having written responses in common does conform to another expected pattern, i.e., that the highest correlation in this set should be between the test using visual stimuli and written responses and the only other test that uses written responses. It was further to be expected that the smallest relationship would be found between the aural stimulus-voice response and the visual stimulus-written response tests. Again this is what our correlations show; in fact, the only significant correlation is found in the interval tests, Table X, and this is the smallest relationship found among the interval pretests. These results confirm Ortmann's (1934) results, and lead to the conclusion that low-level notational responses should not be used to assess even seemingly closely related aural abilities.

Table X

Product-Moment Coefficients of Correlation (r)
between Interval Pretest Scores
Number of Subjects = 71
(coefficients of correlation significant at the 1 per cent level are underlined)

	D1	D4	D6	D8
D1		.54	.73	.49
D4			.69	.39
D6				.39
Mean	12.5	6.8	11.0	16.3
Standard Deviation	5.1	6.3	7.3	4.6

Table XI

Product-Moment Coefficients of Correlation (r)
between Rhythm Pretest Scores
Number of Subjects = 71
(coefficients of correlation significant at the 5 per cent level are underlined)

	E1	E2	E3	E4	E5	E6	E7	E8
E1		.76	.37	.41	.19	.10	.28	.36
2			.30	.41	.17	.12	.24	.35
3				.83	.30	.22	.26	.06
4					.26	.18	.21	.10
5						.63	.00	-.12
6							.20	-.06
7								.40
Mean	25.1	10.7	58.7	30.7	57.5	32.0	58.6	32.7
Standard Deviation	19.2	8.5	8.6	7.7	6.3	4.1	7.1	4.5

Table XII

Product-Moment Coefficients of Correlation (r)
between Tone Group Pretest Scores
Number of Subjects = 71
(coefficients of correlation significant at the 1 per cent level are underlined)

	F1	F2	F3	F4
F1		.58	.33	.29
F2			.59	.17
F3				.01
Mean	1.5	5.2	16.9	19.6
Standard Deviation	3.2	6.5	9.7	8.2

The Analysis of the Differential Effects of Four Experimental Treatments for Three Basic Music Elements

Tables XIII to XXVIII contain the analysis of the differential effects of the various experimental treatments. The parts of each table are numbered for ease of description and comparison. Number 1, is a test of the significance of the overall difference between pretest and posttest scores for all 71 subjects. In Number 2 will be found the test of significance of the effects of the Fundamentals of Music section placement for the quarter of experimental treatment being analyzed. For the Winter and Spring quarter experiments, tests for the significance of the effect of previous experimental treatments also will be found here. The last analysis in Number 2, Other Factors, is a test of the significance of the combined effect of all other control variables described in Part II of this report.

Number 3 contains tests of significance for the experimental treatment being analyzed. This analysis consists of separate tests for (a) the effect of differences in the manner of stimulus presentation, (b) the effect of differences in the manner of response, and (c) the interaction of the various stimulus-response combinations. Number 4 is the error term used as the denominator for all F tests. Number 5 contains simple sums of the columns as given.

Under Number 6 is given the actual pretest mean, posttest mean, and their difference for each of the four experimental groups and for the total 71 subjects. The significance of the difference between the test means for the total number of subjects is shown under Number 1 in each table.

Number 7 shows the posttest-pretest mean differences for the experimental groups when all of the differences attributable to the variables considered under Number 2 have been removed. Since this is a measure only of differences between group means attributable to differences in experimental treatment of the groups, a constant was added to or subtracted from all the means in Number 7 of a given table, so that the treatment group mean showing the smallest effect in that table was set equal to zero. This linear transformation, which in no way changes the magnitude or direction of the differences between groups due to differences in experimental treatment, permits comparisons of the differences represented by these adjusted means, within or between tables, to be made with minimum computation. For each of these sets of adjusted means, where at least one of the experimental treatment effects (3a, 3b, 3c) is significant at the five per cent level, the Duncan-Kramer extension of the F test for differences between pairs of means for groups of unequal sizes was applied.

The five per cent level of significance was used in this report for all analyses related to comparisons of sets of means. For the convenience of the reader all F tests significant at the five per cent level have been indicated with * and all F tests significant at the one per cent level have been indicated with **. In the Duncan-Kramer extension of the F tests, treatment group means which are not connected or underlined by the same line are significantly different at the five per cent level.

Table XIII

Analysis of Variance and Covariance of
Aural Stimulus-Written Response
Interval Posttest-Pretest Difference
Scores of 71 Subjects in Four Groups of Various Sizes
(F Significant at the 5 per cent level indicated by *, 1 per cent by **)

Source	Sum of Squares	Degrees of Freedom	Mean Square	F
1. Grand Mean of Posttest-Pretest Differences	3217.72	1	3217.72	411.47**
2. Fall Quarter Fundamentals of Music Section	7.23	3	2.41	.31
Other Factors	875.74	17	51.51	6.59**
3. Experimental Treatment				
a. Stimulus	122.99	1	122.99	15.73**
b. Response	25.97	1	25.97	3.32
c. Interaction	.65	1	.65	.08
4. Residuals	367.70	47	7.82	
5. Total	4618.00	71		

6. Means and Differences between Means

Fall Quarter Treatment	1	2	3	4	Total
Number	21	17	17	16	71
Pretest	12.3	13.5	11.5	12.8	12.5
Posttest	20.0	19.2	21.2	16.2	19.2
Difference	7.7	5.7	9.7	3.4	6.7

7. Differences between Groups due to Experimental Treatment

Treatment	4	2	1	3
Number of Students	16	17	21	17
Adjusted Mean	0.0	1.2	3.2	4.9

Adjusted means not underlined or connected by the same line are significantly different at the 5 per cent level.

Table XIV

Analysis of Variance and Covariance of
Visual Stimulus-Voice Response
Interval Posttest-Pretest Difference
Scores of 71 Subjects in Four Groups of Various Sizes
(F Significant at the 5 per cent level indicated by *, 1 per cent by **)

Source	Sum of Squares	Degrees of Freedom	Mean Square	F
1. **Grand Mean** of Posttest-Pretest Differences	5860.14	1	5860.14	444.96**
2. **Fall Quarter** Fundamentals of Music Section	20.15	3	6.72	.51
Other Factors	1467.98	17	86.35	6.56**
3. **Treatment of Experimental Groups**				
a. Stimulus	60.73	1	60.73	4.61*
b. Response	161.95	1	161.95	12.30**
c. Interaction	19.09	1	19.09	1.45
4. **Residuals**	618.96	47	13.17	
5. **Total**	8209.00	71		

6. Means and Differences Between Means

Fall Quarter Treatment	1	2	3	4	
Number of Students	21	17	17	16	Total 71
Pretest Mean	4.9	9.2	6.8	6.7	6.8
Posttest Mean	13.3	20.7	16.7	13.2	15.9
Difference	8.4	11.5	9.9	6.5	9.1

7. Differences Between Groups due to Experimental Treatment

Treatment	1	4	3	2
Number of Students	21	16	17	17
Adjusted Mean	0.0	1.0	3.0	6.6

Adjusted means not underlined or connected by the same line are significantly different at the 5 per cent level.

Table XV

Analysis of Variance and Covariance of
Aural Stimulus-Voice Response
Interval Posttest-Pretest Difference
Scores of 71 Subjects in Four Groups of Various Sizes
(F Significant at the 5 per cent level indicated by *, 1 per cent by **)

Source	Sum of Squares	Degrees of Freedom	Mean Square	F
1. **Grand Mean** of Posttest-Pretest Differences	4276.54	1	4276.54	372.52**
2. **Fall Quarter Fundamentals** of Music Section	15.44	3	5.15	.45
Other Factors	2103.10	17	123.71	10.78**
3. **Treatment of Fall Quarter Experimental Groups**				
a. **Stimulus**	142.11	1	142.11	12.38**
b. **Response**	60.21	1	60.21	5.24*
c. **Interaction**	50.06	1	50.06	4.36*
4. **Residuals**	539.54	47	11.48	
5. **Total**	7187.00	71		

6. Means and Differences between Means

Treatment	1	2	3	4	**Total**
Number of Students	21	17	17	16	71
Pretest Mean	8.9	12.0	10.7	13.1	11.0
Posttest Mean	19.7	18.9	20.3	15.7	18.8
Difference	10.8	6.9	9.6	2.6	7.8

7. Differences between groups due to Experimental Treatment

Treatment	4	2	1	3
Number of Students	16	17	21	17
Adjusted Mean	0.0	5.0	6.0	6.8

Adjusted means not underlined or connected by the same line are significantly different at the 5 per cent level.

Table XVI

Analysis of Variance and Covariance of Visual Stimulus-Written Response Interval Posttest-Pretest Difference Scores of 71 Subjects in Four Groups of Various Sizes

(F Significant at the 5 per cent level indicated by *, 1 per cent by **)

Source	Sum of Squares	Degrees of Freedom	Mean Square	F
1. Grand Mean of Posttest-Pretest Differences	**1897.02**	**1**	**1897.02**	**496.60****
2. Fall Quarter Fundamentals of Music Section	**25.71**	**3**	**8.57**	**2.24**
Other Factors	**963.32**	**17**	**56.67**	**14.84****
3. Treatment of Fall Quarter Experimental Groups				
a. Stimulus	**.49**	**1**	**.49**	**.13**
b. Response	**.50**	**1**	**.50**	**.13**
c. Interaction	**24.38**	**1**	**24.38**	**6.38***
4. Residuals	**179.58**	**47**	**3.82**	
5. Total	**3091.00**	**71**		

6. Means and Differences between Means of Test Scores

Treatment	**1**	**2**	**3**	**4**	**Total**
Number of Students	**21**	**17**	**17**	**16**	**71**
Pretest Mean	**15.9**	**15.6**	**17.1**	**16.6**	**16.3**
Posttest Mean	**20.8**	**20.7**	**22.1**	**22.4**	**21.5**
Difference	**4.9**	**5.1**	**5.0**	**5.8**	**5.2**

7. Differences between Groups due to Experimental Treatment

Treatment	**2**	**1**	**3**	**4**
Number of Students	**17**	**21**	**17**	**16**
Adjusted Mean	**0.0**	**0.3**	**1.6**	**1.7**

Adjusted means not underlined or connected by the same line are significantly different at the 5 per cent level.

Table XVII

Analysis of Variance and Covariance of
Aural Stimulus-Written Response
Duple Rhythm Posttest-Pretest Difference
Scores of 71 Subjects in Four Groups of Various Sizes
(F Significant at the 5 per cent level indicated by *, 1 per cent by **)

Source	Sum of Squares	Degrees of Freedom	Mean Square	F
1. **Grand Mean** of Posttest-Pretest Differences	28400.00	1	28400.00	271.10**
2. **Fall Quarter Experimental Treatment**	101.10	3	33.70	.32
Winter Quarter Fundamentals of Music Section	310.20	3	103.40	.99
Other Factors	10968.49	20	548.42	5.24**
3. **Treatment of Winter Quarter Experimental Groups**				
a. **Stimulus**	263.62	1	263.62	2.52
b. **Response**	1073.87	1	1073.87	10.25**
c. **Interaction**	59.60	1	59.60	.57
4. **Residuals**	4295.12	41	104.76	
5. **Total**	45472.00	71		

6. **Means and Differences between Means**

Winter Quarter Treatment	1	2	3	4	
Number of Students	17	18	19	17	Total 71
Pretest Mean	23.1	23.0	22.3	32.6	25.1
Posttest Mean	58.0	40.0	37.0	46.8	45.1
Difference	34.9	17.0	14.7	14.2	20.0

7. **Differences between Means due to Treatment of Winter Quarter Groups**

Treatment	2	3	4	1
Number of Students	18	19	17	17
Adjusted Mean	0.0	1.5	7.4	16.3

Adjusted means not underlined or connected by the same line are significantly different at the 5 per cent level.

Table XVIII

Analysis of Variance and Covariance of
Aural Stimulus-Written Response
Triple Rhythm Posttest-Pretest Difference
Scores of 71 Subjects in Four Groups of Various Sizes
(F Significant at the 5 per cent level indicated by *, 1 per cent by **)

Source	Sum of Squares	Degrees of Freedom	Mean Square	F
1. **Grand Mean** of Posttest-Pretest Differences	11,155.95	1	11,155.95	291.96**
2. **Fall Quarter Experimental Treatment**	57.64	3	19.21	.50
Winter Quarter Fundamentals of Music Section	81.76	3	27.25	.71
Other Factors	2,945.62	20	147.28	3.85**
3. **Treatment of Winter Quarter Experimental Groups**				
a. **Stimulus**	92.36	1	92.36	2.42
b. **Response**	222.75	1	222.75	5.83*
c. **Interaction**	59.21	1	59.21	1.55
4. **Residuals**	1,566.71	41	38.21	
5. **Total**	16,182.00	71		

6. **Means and Differences between Means**

Winter Quarter Treatment	1	2	3	4	
Number of Students	17	18	19	17	Total 71
Pretest Mean	9.4	9.0	9.1	15.4	10.7
Posttest Mean	29.5	20.4	19.6	23.8	23.2
Difference	20.1	11.4	10.5	8.4	12.5

7. **Differences between Means due to Treatment of Winter Quarter Groups**

Treatment	3	2	4	1
Number of Students	19	18	17	17
Adjusted Mean	0.0	.1	2.2	8.4

Adjusted means not underlined or connected by the same line are significantly different at the 5 per cent level.

Table XIX

Analysis of Variance and Covariance of
Visual Stimulus-Voice Response
Duple Rhythm Posttest-Pretest Difference
Scores of 71 Subjects in Four Groups of Various Sizes
(F Significant at the 5 per cent level indicated by *, 1 per cent by **)

Source	Sum of Squares	Degrees of Freedom	Mean Square	F
1. **Grand Mean** of Posttest-Pretest Differences	758.28	1	758.28	77.14**
2. **Fall Quarter Experimental Treatment**	61.35	3	20.45	2.08
Winter Quarter Fundamentals of Music Section	26.30	3	8.77	.89
Other Factors	2660.50	20	133.02	13.53**
3. **Treatment of Winter Quarter Experimental Group**				
a. **Stimulus**	1.03	1	1.03	.10
b. **Response**	.25	1	.25	.03
c. **Interaction**	17.14	1	17.14	1.74
4. **Residuals**	403.15	41	9.83	
5. **Total**	3928.00	71		

6. **Means and Differences between Means**

Winter Quarter Treatment	1	2	3	4	
Number of Students	17	18	19	17	Total 71
Pretest Mean	58.1	61.4	55.5	59.9	58.7
Posttest Mean	62.2	63.4	60.6	61.7	62.0
Difference	4.1	2.0	5.1	1.8	3.3

7. **Difference between Means due to Treatment of Winter Quarter Groups**

Treatment	3	4	1	2
Number of Students	19	17	17	18
Adjusted Mean	0.0	.1	1.0	1.6

Adjusted means not underlined or connected by the same line are significantly different at the 5 per cent level.

Table XX

Analysis of Variance and Covariance of
Visual Stimulus-Voice Response
Triple Rhythm Posttest-Pretest Difference
Scores of 71 Subjects in Four Groups of Various Sizes
(F Significant at the 5 per cent level indicated by *, 1 per cent by **)

Source	Sum of Squares	Degrees of Freedom	Mean Square	F
1. **Grand Mean** of Posttest-Pretest Differences	838.72	1	838.72	99.97**
2. **Fall Quarter Experimental Treatment**	50.01	3	16.67	1.99
Winter Quarter Fundamentals of Music Section	13.57	3	4.52	.54
Other Factors	2523.18	20	126.16	15.04**
3. **Treatment of Winter Quarter Experimental Groups**				
a. Stimulus	2.35	1	2.35	.28
b. Response	.43	1	.43	.05
c. Interaction	27.60	1	27.60	3.29
4. **Residuals**	344.14	41	8.39	
5. **Total**	3800.00	71		

6. Means and Differences between Means

Winter Quarter Treatment	1	2	3	4	
Number of Students	17	18	19	17	Total 71
Pretest Mean	29.3	33.3	27.9	32.6	30.7
Posttest Mean	34.5	35.6	33.2	33.5	34.1
Difference	5.2	2.3	5.3	0.9	3.4

7. Differences between Means due to Treatment of Winter Quarter Groups

Treatment	4	3	2	1
Number of Students	17	19	18	17
Adjusted Mean	0.0	0.6	1.9	2.3

Adjusted means not underlined or connected by the same line are significantly different at the 5 per cent level.

Table XXI

Analysis of Variance and Covariance of
Aural Stimulus-Voice Response
Duple Rhythm Posttest-Pretest Difference
Scores of 71 Subjects in Four Groups of Various Sizes
(F Significant at the 5 per cent level indicated by *, 1 per cent by **)

Source	Sum of Squares	Degrees of Freedom	Mean Square	F
1. **Grand Mean** of Posttest-Pretest Differences	663.07	1	663.07	125.58**
2. **Fall Quarter Experimental Treatment**	26.69	3	8.90	1.69
Winter Quarter Fundamentals of Music Section	8.26	3	2.75	.52
Other Factors	931.78	20	46.59	8.82**
3. **Treatment of Winter Quarter Experimental Groups**				
a. Stimulus	8.10	1	8.10	1.53
b. Response	2.48	1	2.48	.47
c. Interaction	.10	1	.10	.02
4. **Residuals**	216.52	41	5.28	
5. **Total**	1857.00	71		

6. **Means and Differences between Means**

Winter Quarter Treatment	1	2	3	4	
Number of Students	17	18	19	17	Total 71
Pretest Mean	57.3	57.3	56.9	58.5	57.4
Posttest Mean	61.2	60.0	60.7	60.1	60.5
Difference	3.9	2.7	3.8	1.6	3.1

7. **Differences between Means due to Treatment of Winter Quarter Groups**

Treatment	4	2	3	1
Number of Students	17	18	19	17
Adjusted Mean	0.0	.7	1.2	1.2

Adjusted means not underlined or connected by the same line are significantly different at the 5 per cent level.

Table XXII

Analysis of Variance and Covariance of Visual Stimulus-Voice Response Triple Rhythm Posttest-Pretest Difference Scores of 71 Subjects in Four Groups of Various Sizes
(F Significant at the 5 per cent level indicated by *, 1 per cent by **)

Source	Sum of Squares	Degrees of Freedom	Mean Square	F
1. **Grand Mean** of Posttest-Pretest Differences	111.65	1	111.65	26.27**
2. **Fall Quarter Experimental Treatment**	3.43	3	1.14	.27
Winter Quarter Fundamentals of Music Section	13.54	3	4.51	1.06
Other Factors	515.88	20	25.79	6.07**
3. **Treatment of Winter Quarter Experimental Groups**				
a. **Stimulus**	6.63	1	6.63	1.56
b. **Response**	.21	1	.21	.05
c. **Interaction**	1.46	1	1.46	.34
4. **Residuals**	174.20	41	4.25	
5. **Total**	827.00	71		

6. **Means and Differences between Means**

Winter Quarter Treatment	1	2	3	4	
Number of Students	17	18	19	17	Total 71
Pretest Mean	33.1	31.6	31.2	32.4	32.0
Posttest Mean	34.0	32.5	33.7	33.1	33.3
Difference	.9	.9	2.5	.7	1.3

7. **Differences between Means due to Treatment of Winter Quarter Groups**

Treatment	2	4	1	3
Number of Students	18	17	17	19
Adjusted Mean	0.0	0.2	0.8	1.0

Adjusted means not underlined or connected by the same line are significantly different at the 5 per cent level.

Table XXIII

Analysis of Variance and Covariance of Visual Stimulus-Written Response Duple Rhythm Posttest-Pretest Difference Scores of 71 Subjects in Four Groups of Various Sizes

(F Significant at the 5 per cent level indicated by *, 1 per cent by **)

	Source	Sum of Squares	Degrees of Freedom	Mean Square	F
1.	**Grand Mean** of Posttest-Pretest Differences	852.44	1	852.44	76.25**
2.	**Fall Quarter Experimental Treatment**	61.95	3	20.65	1.85
	Winter Quarter Fundamentals of Music Section	11.65	3	3.88	.35
	Other Factors	3360.75	20	168.04	15.03**
3.	**Treatment of Winter Quarter Experimental Groups**				
	a. Stimulus	10.94	1	10.94	.98
	b. Response	21.65	1	21.65	1.94
	c. Interaction	48.06	1	48.06	4.30*
4.	**Residuals**	458.56	41	11.18	
5.	**Total**	4826.00	71		

6. **Means and Differences between Means**

Winter Quarter Treatment	**1**	**2**	**3**	**4**	**Total**
Number of Students	17	18	19	17	71
Pretest Mean	58.9	57.9	57.5	60.1	58.6
Posttest Mean	61.6	61.0	62.1	63.5	62.1
Difference	2.7	3.1	4.6	3.4	3.5

7. **Differences between Means due to Treatment of Winter Quarter Groups**

Treatment	**2**	**1**	**3**	**4**
Number of Students	18	17	19	17
Adjusted Mean	0.0	0.2	1.4	3.7

Adjusted means not underlined or connected by the same line are significantly different at the 5 per cent level.

Table XXIV

Analysis of Variance and Covariance of
Visual Stimulus-Written Response
Triple Rhythm Posttest-Pretest Difference
Scores of 71 Subjects in Four Groups of Various Sizes
(F Significant at the 5 per cent level indicated by *, 1 per cent by **)

Source	Sum of Squares	Degrees of Freedom	Mean Square	F
1. **Grand Mean** of Posttest-Pretest Differences	54.11	1	54.11	2.71
2. **Fall Quarter Experimental Treatment**	74.28	3	24.76	1.24
Winter Quarter Fundamentals of Music Section	86.57	3	28.86	1.44
Other Factors	1292.67	20	64.63	3.23**
3. **Treatment of Winter Quarter Experimental Groups**				
a. **Stimulus**	10.97	1	10.97	.55
b. **Response**	43.24	1	43.24	2.16
c. **Interaction**	.46	1	.46	.02
4. **Residuals**	819.70	41	19.99	
5. **Total**	2382.00	71		

6. **Means and Differences between Means**

Winter Quarter Treatment	1	2	3	4	
Number of Students	17	18	19	17	Total 71
Pretest Mean	31.6	32.2	32.6	34.4	32.7
Posttest Mean	34.2	32.4	33.4	34.2	33.6
Difference	2.6	0.2	0.8	-0.2	.9

7. **Differences between Means due to Treatment of Winter Quarter Groups**

Treatment	2	3	4	1
Number of Students	18	19	17	17
Adjusted Mean	0.0	1.0	2.2	3.3

Adjusted means not underlined or connected by the same line are significantly different at the 5 per cent level.

Table XXV

Analysis of Variance and Covariance of
Aural Stimulus-Written Response
Tone Group Posttest-Pretest Difference
Scores of 71 Subjects in Four Groups of Various Sizes
(F Significant at the 5 per cent level indicated by *, 1 per cent by **)

Source	**Sum of Squares**	**Degrees of Freedom**	**Mean Square**	**F**
1. **Grand Mean** of Posttest-Pretest Differences	1250.65	1	1250.65	47.39**
2. **Fall Quarter Experimental Treatment**	80.63	3	26.88	1.02
Winter Quarter Experimental Treatment	9.59	3	3.20	.12
Spring Quarter Fundamentals of Music Section	50.23	3	16.74	.63
Other Factors	1314.18	20	65.71	2.49**
3. **Treatment of Spring Quarter Experimental Groups**				
a. Stimulus	43.40	1	43.40	1.64
b. Response	62.36	1	62.36	2.36
c. Interaction	22.04	1	22.04	.84
4. **Residuals**	1002.92	38	26.39	
5. **Total**	3836.00	71		

6. **Means and Differences between Means of Test Scores**

Spring Quarter Treatment	1	2	3	4	
Number of Students	16	17	19	19	Total 71
Pretest Mean	2.7	.6	2.2	.7	1.5
Posttest Mean	11.8	2.1	5.2	4.4	5.7
Difference	9.1	1.5	3.0	3.7	4.2

7. **Differences between Means due to Treatment of Spring Quarter Groups**

Treatment	2	3	4	1
Number of Students	17	19	19	16
Adjusted Mean	0.0	1.1	1.1	5.7

Adjusted means not underlined or connected by the same line are significantly different at the 5 per cent level.

Table XXVI

Analysis of Variance and Covariance of
Visual Stimulus-Voice Response
Tone Group Posttest-Pretest Difference
Scores of 71 Subjects in Four Groups of Various Sizes
(F Significant at the 5 per cent level indicated by *, 1 per cent by **)

Source	Sum of Squares	Degrees of Freedom	Mean Square	F
1. **Grand Mean** of Posttest-Pretest Differences	930.41	1	930.41	46.01**
2. **Fall Quarter Experimental Treatment**	44.14	3	14.71	.73
Winter Quarter Experimental Treatment	50.97	3	16.99	.84
Spring Quarter Fundamentals of Music Section	271.31	3	90.44	4.47**
Other Factors	1529.22	20	76.46	3.78**
3. **Treatment of Spring Quarter Experimental Groups**				
a. **Stimulus**	3.30	1	3.30	.16
b. **Response**	128.47	1	128.47	6.35*
c. **Interaction**	10.91	1	10.91	.54
4. **Residuals**	768.27	38	20.22	
5. **Total**	3737.00	71		

6. **Means and Differences between Means of Test Scores**

Spring Quarter Treatment Group	1	2	3	4	
Number of Students	16	17	19	19	**Total** 71
Pretest Mean	5.5	4.6	6.4	4.4	5.2
Posttest Mean	8.9	12.2	8.6	6.1	8.8
Difference	3.4	7.6	2.2	1.7	3.6

7. **Differences between Means due to Treatment of Spring Quarter Groups**

Treatment	4	1	3	2
Number of Students	19	16	19	17
Adjusted Mean	0.0	.4	3.4	5.3

Adjusted means not underlined or connected by the same line are significantly different at the 5 per cent level.

Table XXVII

Analysis of Variance and Covariance of
Aural Stimulus-Voice Response
Tone Group Posttest-Pretest Difference
Scores of 71 Subjects in Four Groups of Various Sizes
(F Significant at the 5 per cent level indicated by *, 1 per cent by **)

		Sum of Squares	Degrees of Freedom	Mean Square	F
1.	**Grand Mean** of Posttest-Pretest Differences	4168.13	1	4168.13	80.25**
2.	**Fall Quarter Experimental Treatment**	137.59	3	45.86	.88
	Winter Quarter Experimental Treatment	203.19	3	67.73	1.30
	Spring Quarter Fundamentals of Music Section	395.26	3	131.75	2.54
	Other Factors	5523.80	20	276.19	5.32**
3.	**Treatment of Spring Quarter Experimental Groups**				
	a. Stimulus	35.87	1	35.87	.69
	b. Response	114.06	1	114.06	2.20
	c. Interaction	.55	1	.55	.01
4.	**Residuals**	1973.55	38	51.94	
5.	**Total**	12,552.00	71		

6. Means and Differences between Means of Test Scores

Spring Quarter Treatment	1	2	3	4	
Number of Students	16	17	19	19	Total 71
Pretest Mean	16.2	14.2	19.6	17.2	16.9
Posttest Mean	24.7	24.7	26.9	22.0	24.6
Difference	8.5	10.5	7.3	4.8	7.7

7. Differences between Means due to Treatment of Spring Quarter Groups

Treatment	1	4	3	2
Number of Students	16	19	19	17
Adjusted Mean	0.0	2.4	3.7	6.4

Adjusted means not underlined or connected by the same line are significantly different at the 5 per cent level.

Table XXVIII

Analysis of Variance and Covariance of
Visual Stimulus-Written Response
Tone Group Posttest-Pretest Difference
Scores of 71 Subjects in Four Groups of Various Sizes
(F Significant at the 5 per cent level indicated by *, 1 per cent by **)

	Source	Sum of Squares	Degrees of Freedom	Mean Square	F
1.	**Grand Mean** of Posttest-Pretest Differences	2789.45	1	2789.45	72.08**
2.	**Fall Quarter Experimental Treatment**	137.28	3	45.76	1.18
	Winter Quarter Experimental Treatment	68.20	3	22.73	.59
	Spring Quarter Fundamentals of Music Section	203.99	3	68.00	1.76
	Other Factors	2196.09	20	109.80	2.84**
3.	**Treatment of Spring Quarter Experimental Groups**				
	a. Stimulus	12.74	1	12.74	.33
	b. Response	210.57	1	210.57	5.44*
	c. Interaction	14.07	1	14.07	.36
4.	**Residuals**	1470.61	38	38.70	
5.	**Total**	7103.00	71		

6. Means and Differences between Means of Test Scores

Spring Quarter Treatment	**1**	**2**	**3**	**4**	**Total**
Number of Students	**16**	**17**	**19**	**19**	**71**
Pretest Mean	**22.9**	**13.9**	**19.3**	**22.0**	**19.6**
Posttest Mean	**29.5**	**20.7**	**22.7**	**30.4**	**25.9**
Difference	**6.6**	**6.8**	**3.4**	**8.4**	**6.3**

7. Differences between Means due to Treatment of Spring Quarter Groups

Treatment	**2**	**3**	**4**	**1**
Number of Students	**17**	**19**	**19**	**16**
Adjusted Mean	**0.0**	**0.2**	**4.7**	**7.6**

Adjusted means not underlined or connected by the same line are significantly different at the 5 per cent level.

Results of Tests of the Significance of Differences in Posttest-Pretest Difference Scores due to Experimental Treatments

Intervals

The maximum possible score on each interval test was 24.

Aural Stimulus-Written Response, Table XIII, Items 3 and 7

The differences in group means due to experimental treatments are attributable to differences in the manner of stimulus presentation. These results indicate that if the objective is improvement on the interval task represented by this test, it does not matter whether students practice with voice or written responses as long as the stimulus is presented aurally.

Visual Stimulus-Voice Response, Table XIV, Items 3 and 7

For this task both the manner of stimulus presentation and the mode of response significantly affect the experimental outcome. Clearly the best way to secure improvement in this task is to give the direct training, treatment 2. Treatment 3 (aural stimulus-voice response) is better than treatment 1, which differs from treatment 2 in both stimulus and response modes.

Aural Stimulus-Voice Response, Table XV, Items 3 and 7

Significant interaction effects complicate the interpretation of results. In this case, however, the result itself poses little problem. There is no better training than the task itself, while treatment 4, which has no sound component, is the least effective treatment. Treatment 1, with a sounded response, and treatment 2, with a sounded stimulus, are not significantly different in effect from treatment 3, itself. That treatments 1 and 2 are equally effective is here interpreted as the result of interaction. The reason for this result is not known.

Visual Stimulus-Written Response, Table XVI, Items 3 and 7

The only significant effect here is the one due to interaction of stimulus mode and response mode. It should be noted that this was the easiest of the four interval tasks, as shown by interval pretest scores, and that the overall mean for posttest scores is within 2.5 points--2.5 correct items--of perfect posttest scores. It is possible to say that treatment 4 is more effective than treatment 2, but a difference of less than two correct items cannot be considered to be important. It seems reasonable to believe that work in any interval treatment mode will lead to practically equivalent improvement. It may be, however, that real differences among the treatments were obscured by the fact that all groups achieved a level on this task close to the upper limit of possible scores. Such a situation reduces the range of possible differences. The results for this interval treatment mode may be considered to be inconclusive.

Rhythm

The tests for each of the four rhythm experimental modes were divided into two parts, duple and triple divisions of the beat. The maximum possible score for each duple test was 64, for each triple test, 36. Only pretest scores for treatment 1 (aural stimulus-written response) were far enough below these levels to expect any conclusive results related to the differential effect of treatments on the posttest-pretest differences. The results confirm this expectation. For experimental treatments 2, 3, and 4 (Table XXIII) only treatment 4, duple rhythms, shows any significant differential effect due to treatments. While this difference is the "appropriate" one it is too small to be of any practical value. Only the tests for aural stimulus-written response, duple and triple rhythm, will be considered here.

Aural Stimulus-Written Response, Duple Rhythm, Table XVII, Items 3 and 7; and Triple Rhythm, Table XVIII, Items 3 and 7

For both tests of experimental treatment 1, differences are due to differences in the manner of response required in the experimental treatments. The task in treatment 1 clearly produces more improvement in performance than those treatments which require a voice response. For triple rhythms it is the only significantly different treatment. For duple rhythms it is not significantly different from treatment 4 (visual stimulus-written response) but, since treatment 4 is, in turn, not significantly different from the remaining treatments the choice of best treatment is clear enough. Why the task related to treatment 1 should be relatively difficult while the other three tasks are quite easy, poses a major problem.

Tone Groups

All tone group tasks were extremely difficult; the maximum possible score on each test was 36. No significant differences are apparent for treatment 1 (aural stimulus-written response), Table XXV, and treatment 3 (aural stimulus-voice response), Table XXVII. These two treatments have the characteristic of aural stimulus presentation in common.

Visual Stimulus-Voice Response, Table XXVI, Items 3 and 7

For this task, in spite of the fact that neighboring pairs of adjusted means are not significantly different, the order of differences does match the fact that the significant effect is the mode of response. Again there is no better practice than the task itself, but at the same time these results give no reason to believe that there is any difference in experimental effect between the two experimental treatments calling for voice response. However, there is no doubt that treatment 2, most nearly related to the task, is superior to the two treatments calling for written response.

Visual Stimulus-Written Response, Table XXVIII, Items 3 and 7

Again differential effects of treatment are due to the mode of response. These results give us no reason to believe that treatments 1 or 4 differ in their effectiveness. Either of these two treatments is clearly more effective than treatments 2 and 3 which call for voice responses.

Relationships between Time Spent in Experimental Treatment and Posttest-Pretest Difference Scores

Tables XXIX, XXX, and XXXI give correlations for intervals, rhythm, and tone groups, respectively. It is the normal expectation that there would be a positive relationship between time spent and the amount of improvement in test scores. However, when there is no significant effect due to experimental treatment, or where pretest scores were so high that little posttest-pretest differences are possible, or when some combination of these two conditions exists, we would have little reason to expect significant correlations. These expectations are clearly met in the relationships of time to interval difference scores, except for the visual stimulus-written response scores where we are least sure that differences due to experimental treatment exist (Table XXIX). Here the significant effect is due to interaction, and unambiguous interpretation is quite impossible with our present information. All we can say is that those who received this particular training were significantly, but trivially, better than those who were trained by the least similar method - i.e., aural stimulus with voiced response. For rhythm (Table XXX) the same agreement between expectation and results is shown. The sole exception is found for visual stimulus-written response duple rhythm scores. Here again we are least sure that a difference due to experimental treatment exists, the significant effect is due to interaction, and the absolute differences are quite small.

For the tone group tests, Table XXXI, no significant correlation of time and difference scores exists.

There are some outcomes we cannot interpret given the present state of knowledge. The results for F11-F1 and F13-F3 (Tables XXV and XXVII) match our expectations. However, for F12-F2 and F14-F4 (Tables XXVI and XXVIII) we find significant effects due to differences in the response required. The absolute differences between the best and worst groups are also large enough to be important. To this we must again state that the tone groups were by far the most difficult of all the experimental tasks; while the rhythm tasks, where there was no effect of time on test scores, were much the easiest. Whatever the causes, they must be different for the rhythm results than for the tone group results.

Relationships between Pretest, Posttest-Pretest Difference Scores

Tables XXXII, XXXIII, and XXXIV show the correlations between pretest scores and posttest-pretest difference scores. If a task is not beyond the ability of the poorer subjects it is to be expected that correlations between pretest scores and posttest-pretest difference scores will be negative, if only because there is more room for improvement on the part of the poorer subjects. The F1 pretest was the most difficult of all and had the least variable scores. This is the only nonsignificant correlation. The four experimental methods permitted each student to work through a learning task for intervals, rhythms, and tone groups at his own rate. They did not discriminate against the poorer students.

Modification of the ordering of these tasks, and methods such as the arrangements of elements inside each task, may be accomplished by utilizing the information derived from maintaining experimental control of such programs of instruction. At the limit of this improvement all students reach the criterion scores for each task and the correlations approach 1.00. The best students, approximately the top 10 per cent, seem to acquire aural skills with any type of training. The importance of the increased opportunities for the remaining 90 per cent of the students to acquire these skills, provided by well-ordered individual learning programs, can hardly be over estimated.

Table XXIX

Product-Moment Coefficients of Correlation (r)
between Time Spent in Experimental Interval Treatment and
Interval Posttest-Pretest Difference Scores
Number of Subjects = 71
(coefficients of correlation significant at the 1 per cent level are underlined)

	D11-D1	D14-D4	D16-D6	D18-D8	Mean	Standard Deviation
Time	.57	.42	.46	.05	13,046 seconds	8,005 seconds
Mean	6.7	9.1	7.8	5.2		
Standard Deviation	4.5	5.8	6.4	4.1		

Table XXX

Product-Moment Coefficients of Correlation (r)
between Time Spent in Experimental Rhythm Treatment and
Rhythm Posttest-Pretest Difference Scores
Number of Subjects = 71
(coefficients of correlation significant at the 1 per cent level are underlined)

	E11-1	E12-2	E13-3	E14-4	E15-5	E16-6	E17-7	E18-8	Mean	Standard Deviation
Time	.53	.41	.13	.20	.16	-.02	-.11	.21	5,730 seconds	2,204 seconds
Mean	20.0	12.5	3.3	3.4	3.1	1.3	3.5	0.9		
Standard Deviation	15.6	8.5	6.7	6.5	4.1	3.2	7.5	5.8		

Table XXXI

Product-Moment Coefficients of Correlation (r)
between Time Spent in Experimental Tone Group Treatment and
Tone Group Posttest-Pretest Difference Scores
Number of Subjects = 71

	F11-F1	F12-F2	F13-F3	F14-F4	Mean	Standard Deviation
Time	.28	-.09	-.02	-.03	11,104 seconds	6,796 seconds
Mean	4.2	3.6	7.7	6.3		
Standard Deviation	6.1	6.3	10.9	7.8		

Table XXXII

Product-Moment Coefficients of Correlation (r) of
Interval Pretests Scores with
Related Interval Posttest-Pretest Difference Scores
Number of Subjects = 71
(coefficients of correlation significant at the 1 per cent level are underlined)

	D11-D1	D14-D4	D16-D6	D18-D8	Mean	Standard Deviation
D1	-.55				12.5	5.1
D4		-.49			6.8	6.3
D6			-.71		11.0	7.3
D8				-.85	16.3	4.6
Mean	6.7	9.1	7.8	5.2		
Standard Deviation	4.5	5.8	6.4	4.1		

Table XXXIII

Product-Moment Coefficients of Correlation (r)
Rhythm Pretest Scores with Related Rhythm Posttest-Pretest Difference Scores
Number of Subjects = 71
(coefficients of correlation significant at the 1 per cent level are underlined)

	E11-E1	E12-E2	E13-E3	E14-E4	E15-E5	E16-E6	E17-E7	E18-E8	Mean	Standard Deviation
E1	-.46								25.1	19.2
2		-.35							10.7	8.5
3			-.86						58.7	8.6
4				-.89					30.7	7.7
5					-.84				57.5	6.3
6						-.82			32.0	4.1
7							-.89		58.6	7.1
8								-.67	32.7	4.5
Mean	20.0	12.5	3.3	3.4	3.1	1.3	3.5	.9		
Standard Deviation	15.6	8.5	6.7	6.5	4.1	3.2	7.5	5.8		

Table XXXIV

Product-Moment Coefficients of Correlation (r) of
Tone Group Pretest Scores with Related Tone Group Posttest-Pretest Difference Scores
Number of Subjects = 71
(coefficients of correlation significant at the 1 per cent level are underlined)

	F11-F1	F12-F2	F13-F3	F14-F4	Mean	Standard Deviation
F1	.29				1.5	3.2
F2		-.38			5.2	6.5
F3			-.58		16.9	9.7
F4				-.49	19.6	8.2
Mean	4.2	3.6	7.7	6.3		
Standard Deviation	6.1	6.3	10.9	7.8		

Relationships between Selected Course Grades and Experimental Test Scores

Grades in the Fundamentals of Music and Applied Music were included among the "Other Factors" in these experiments, not only to increase the precision of the test of the effects of experimental treatment, but also to estimate the relationship of these experimental tasks to the overall activities represented by course grades in these two most important sequences of study in all music curricula. No course grades were used for the interval experiment because all "Other Factors" were, of necessity, measures taken before the relevant experimental pretests were given. The individual correlations of test scores with Fundamentals of Music grades provide a measure of the effect of previous instruction on pretest and posttest-pretest difference scores. Thus, the effect of musical training prior to the actual experimental treatment is accounted for by the combination of all the "Other Factors" discussed above. The effect of concurrent training in Fundamentals of Music is accounted for in the Analyses of Variance and Covariance tables under Item 2.

Relationships between English Course Grades and Experimental Test Scores

One of the problems in establishing effective learning programs in musical skills is that instructions and procedures may be quite complicated. The result can be that these complex aural, visual, and notational tasks may be loaded in favor of those students with high linquistic skills. Ohio State University freshman English grades have been found to be good measures of such verbal loading. English grades will not be found in Tables VII, VIII, IX, XXXV, XXXVI, or XXXVII because there were no significant correlations between English grades and any experimental test scores. We conclude, by this measure, that the programs were constructed in such a fashion that the ability to handle the linquistic content of the program was not an important factor.

Table XXXV

Product-Moment Coefficients of Correlation (r) of Selected Background and School of Music Test Scores with Interval Posttest-Pretest Difference Scores

Number of Subjects = 71

(coefficients of correlation significant at the 1 per cent level are underlined)

	D11-D1	D14-D4	D16-D6	D18-D8	Mean	Standard Deviation
Music Theory Training in High School	-.28	-.11	-.16	-.46	0.5	0.5
Music Placement Test Battery						
Section I, Aural and Notational Skills	-.32	.02	-.20	-.43	41.3	5.8
Section II, Music Recognition	-.31	-.16	-.12	-.15	37.1	6.2
Section III, General Musical Information	-.38	-.06	-.20	-.25	33.2	7.6
Diagnostic Test Battery Elements of Music Theory Total Score						
Notation Speed	-.30	-.11	-.12	-.43	52.8	14.9
Notation Accuracy	-.27	.02	-.23	-.59	58.3	18.5
Notation Output	-.37	-.02	-.24	-.59	31.7	16.2
Aural Recognition	-.37	-.03	-.19	-.30	65.0	16.5
Mean	6.7	9.1	7.8	5.2		
Standard deviation	4.5	5.8	6.4	4.1		

Table XXXVI

Product-Moment Coefficients of Correlation (r) of Selected School of Music Test Scores and First Quarter Course Grades with Rhythm Posttest-Pretest Difference Scores
Number of Subjects = 71
(coefficients of correlation significant at the 1 per cent level are underlined)

	E11 -E1	E12 -E2	E13 -E3	E14 -E4	E15 -E5	E16 -E6	E17 -E7	E18 -E8	**Mean**	**Standard Deviation**
Music Placement Test Battery										
Section II, Music Recognition	.05	.12	-.32	-.14	-.08	-.15	-.12	.02	37.1	6.2
Section III, General Musical Information	-.07	.00	-.19	-.11	.06	-.04	-.37	-.16	33.2	7.6
Ohio State Psychological Examination	.07	.11	-.27	-.34	-.10	.01	-.12	-.07	75.0	21.1
Diagnostic Test Battery Elements of Music Theory Total Scores										
Notation Accuracy	.05	.15	-.32	-.18	.06	-.08	-.22	-.01	58.3	18.5
Visual Recognition	.00	-.05	-.39	-.25	-.09	-.04	-.18	.00	46.9	16.7
Course Grades										
One Quarter Freshman Music Theory	.10	.10	-.36	-.33	-.01	-.08	-.14	.00	2.7	1.1
Mean	20.0	12.5	3.3	3.4	3.1	1.3	3.5	0.9		
Standard Deviation	15.6	8.5	6.7	6.5	4.1	3.2	7.5	5.8		

Table XXXVII

Product-Moment Coefficients of Correlation (r)
of Selected School of Music Test Scores and Two-Quarter
Course Grade Averages with Tone Group Posttest-Pretest Difference Scores
Number of Subjects = 71
(coefficients of correlation significant at the 1 per cent level are underlined)

	F11-F1	F12-F2	F13-F3	F14-F4	Mean	Standard Deviation
Music Placement Test Battery						
Section I, Aural and Notational Skill	.47	.08	.19	-.01	41.3	5.6
Diagnostic Test Battery Elements of Music Theory Total Score						
Aural Recognition	.37	.15	.29	-.20	65.0	16.5
Course Grades						
First Two Quarters of Freshman Music Theory	.35	.17	.20	-.15	2.7	1.0
Mean	4.2	3.6	7.7	6.3		
Standard Deviation	6.1	6.3	10.9	7.8		

PART IV

DISCUSSION AND SUMMARY

Tables XXXVIII to XL summarize the significant differences shown in the Analysis of Variance and Covariance Tables, XIII to XXVIII. These summary tables of F tests significant at the 5 per cent and 1 per cent levels are, perhaps, the most convenient reference and provide the essential information. Once the level of significance is chosen, all formal decisions are of a categorical nature. The following discussion is based on a 5 per cent significance level (x). Those who wish to do so may apply the more severe 1 per cent level (xx).

Grand Mean

The F test on Grand Mean tests the significance of the difference between pretest and posttest means for the total group of 71 subjects. This test, rarely used, was included because the possibility existed that there would be no significant main effects. This occurred in several analyses.

It may be seen that posttest-pretest differences were significant for the total sample on all tasks except E18-E8. Tables XXXVIII to XL indicate a significant improvement was made on all the tasks reported in this study except that of learning triple rhythms by transcribing visually presented verbal descriptions into notational symbols. The data show no relationship of this task to any of the control variables considered individually, and only a small relationship to the related task on the pretest of transcribing duple rhythms from verbal descriptions. All other tasks, however, show a significant improvement.

We know that in every other case significant improvement was made whether or not differential treatment effects exist. We cannot uniquely determine the source of these improvements. However, the separate correlations of selected "Other Factors" with posttest-pretest difference scores (Tables VII-IX and XXXV-XXXVII) provide a basis for the investigation of these sources. "Other Factors" accounts for individual differences. Therefore, a significant F for "Other Factors" present in every analysis, even E18-E8 where there was no significant difference in posttest-pretest grand means, indicates that individual differences in what students brought to these experiments did, in fact, affect individual outcomes. There is no reason to believe that these individual effects would necessarily accumulate in such a fashion as to produce, of themselves, a significant difference in these grand means. Even where main effects are found, changes credited to training are not given directly because the main question was on differential effects of training. The differential effects are shown in Number 7 in each Analyses of Variance and Covariance table.

One important question in this kind of experiment is: How do we know that the background of experience and ability brought to the experimental situation by the subjects, or the simple passing of time, or being in a particular atmosphere--in this case a school of music, or presumably related training such as that received in concurrent music courses, does not account for changes which occur in the responses of the experimental subjects? In this set of experiments this question has been answered in two ways. First of all, these are the kinds of effects tested under Number 2 in each of the statistical analyses of the experiments. Second, for treatments 1, 2, and 3, which include an aural aspect, the results for the group given experimental treatment 4, which had no aural aspect, must represent an upper limit of what can be expected in the way of improvement in the tasks used in treatments 1, 2, and 3, in the absence of such specific training. That is to say, the effect of the passing of time, plus a music school atmosphere, plus the specific course in music taken concurrently, are not likely to be greater than the effect from treatment 4.

Teacher-Section Effect

Students in these experiments were taught in four different class sections and by three different teachers. The same three teachers taught all three courses in the sequence in freshman Fundamentals of Music. It has been indicated in Part II that students are placed in the first quarter Fundamentals of Music section. Many of them stay in the same section with the same teacher for the other two quarters. However, no restriction is placed on their enrolling in a different section. It is impossible to separate teacher effect and section effect. In statistical terms the two effects are inextricably confounded. However, the combined effect has been taken into account and will be found under Number 2 in the Analysis of Variance and Covariance tables.

In only one analysis (Table XXVI) out of 16 was there evidence of a teacher-section effect on the experimental outcome. The reason for this effect is not clear and needs further investigation. The weight of the evidence is that any relationship between teacher-section conditions and the effectiveness of these kinds of laboratory training would be quite small. This is certainly true at The Ohio State University. There is no reason to doubt that the same situation would exist in other university Schools of Music large enough to be teaching basic courses in music theory in a multi-teacher, multi-section situation.

Table XXXVIII

A Summary of the Analysis of Variance and Covariance of Difference between Pretest and Posttest Experiment 1, Intervals Scores for 71 Subjects in Four Groups of Various Sizes

Source	D11-D1	D14-D4	D16-D6	D18-D8
1. Grand Mean	xx	xx	xx	xx
2. Fall Quarter Section	--	--	--	--
Other Factors	xx	xx	xx	xx
3. Experimental Treatment				
a. Stimulus	xx	x	xx	--
b. Response	--	xx	x	--
c. Interaction	--	--	x	x

Table XXXIX

A Summary of the Analysis of Variance and Covariance of Difference between Pretest and Posttest Experiment 2, Rhythm Scores for 71 Subjects in Four Groups of Various Sizes

Source	E11-E1	E12-E2	E13-E3	E14-E4	E15-E5	E16-E6	E17-E7	E18-E8
1. Grand Mean	xx	xx	xx	xx	xx	xx	xx	--
2. Winter Quarter Section	--	--	--	--	--	--	--	--
Fall Quarter Experimental Treatment	--	--	--	--	--	--	--	--
Other Factors	xx	xx	xx	xx	xx	xx	xx	xx
3. Experimental Treatment								
a. Stimulus	--	--	--	--	--	--	--	--
b. Response	xx	x	--	--	--	--	--	--
c. Interaction	--	--	--	--	--	--	x	--

Fall and Winter Quarter Experimental Treatment Effect

There is no indication that Fall experimental treatments had any significant effect upon the results of the Winter and Spring experiments. Nor is there any evidence of a Fall or Winter quarter effect on the Spring quarter experiment.

Other Factors

In each of the tasks in all three experiments, "Other Factors" is shown to have a significant effect. This demonstrates that measurable individual differences in students play an important part in changes in experimental test scores under the conditions of these experiments. Therefore measures of individual differences can be used as a basis for developing these methods into highly individualized methods for learning.

A Generalization of the Effects of the Experimental Treatments

Table XLI presents the tasks in which there was a significant stimulus effect, response effect, or interaction effect. A significant response effect is shown for six of the tasks for which there were significant effects from some portion of the experimental treatment. There were only three tasks in which the stimulus effect was significantly different. It is apparent that these effects vary with the task performed and with the material to be learned. The evidence supports the need to determine appropriate stimulus and response patterns for the learning of particular materials. It appears that what the learner does in the way of response is more important in learning these five tasks than whether there is an aural or visual mode of presentation. The stimulus was a significant factor in three out of the four methods when learning to perceive the combination of tones in the interval experiment. Two of the methods, D11 and D16, involved an aural stimulus; the third, D14, utilized a visual stimulus.

The interaction effect was significant in the aural stimulus-voice response task for intervals, as well as for the visual stimulus-written response task for both intervals and duple rhythms. This, of course, does not permit a simple statement as to the effectiveness of either stimulus presentation or response mode. The significant interaction effect provides no information as to exactly what interaction takes place in these tasks. Nor, does the statistical measurement of the interaction effect provide the information about how the interaction takes place. Present knowledge does not include the answer to the above questions. The possibility of speculation is considerable. One question that evolves from such a situation is: does the individual internalize the stimulus or response in these tasks before making a final judgment?

Table XL

A Summary of the Analysis of Variance and Covariance of Difference between Pretest and Posttest Experiment 3, Tone Groups Scores for 71 Subjects in Four Groups of Various Sizes

Source	F11-F1	F12-F2	F13-F3	F14-F4
1. Grand Mean	xx	xx	xx	xx
2. Spring Quarter Section	--	xx	--	--
Fall Quarter Experimental Treatment	--	--	--	--
Winter Quarter Experimental Treatment	--	--	--	--
Other Factors	xx	xx	xx	xx
3. Experimental Treatment				
a. Stimulus	--	--	--	--
b. Response	--	x	--	x
c. Interaction	--	--	--	--

A summary comparison of the differences between pretest-posttest group means, due to differences in experimental treatment of the groups for each experiment, is shown in Tables XLII to XLIV. The individual significant differences due to the experimental treatment have been shown and discussed. The statistical test applied for differences in these sets of adjusted means was discussed on page 56 of this report. The differences which may be observed in these summary tables provide interesting material, about which one might speculate. No statistical test has been applied to these data other than that previously cited. It should be noted, however, that a comparison of the differences in these summary tables provides a way of looking at the overall change that was made by each group for all tasks. The reader is reminded that zero in these data does not represent lack of improvement, but does indicate the group mean showing the smallest experimental effect. Likewise, the largest number does not indicate the actual improvement, but indicates a relationship of improvement among the groups (c.f. page 56 for a discussion of this analysis).

In all three experiments, all groups, except three (group 1 on task D11-D1, group 4 on task E14-E4, and group 2 on task F12-F2), made the most improvement on the tasks for which they were trained. This would indicate the relatively high specificity of these tasks. In the interval experiment, however, group 1 showed more gain on the task which employed an identical stimulus but required a voice response. In the rhythm experiment group 4 made more gain on task 1 which required a similar response. This group, however, was given a different stimulus on their own task. In the tone group experiment, group 2 made more gain on task 3 which required an identical response. No data can be provided to explain these results. There is, however, the possibility that motivation may have been at a higher level for those groups on tasks which were similar but enough different to encourage a higher level of performance. In other words, these three groups may have taken their training for granted and the variation of method provided incentive.

The rows of Tables XLII-XLIV, which represent the difference between group means due to experimental treatment of the groups, can be added. The observation is that for the interval and rhythm experiment there is one method for which the sum of all the differences in that experiment is higher than for the other methods. The methods vary for each of the basic elements. For intervals, it is the aural presentation-voice response row which shows the larger sum. For rhythm, it is the aural stimulus-written response row which shows the larger sum. For tone groups, however, two contrasting methods, aural stimulus-voice response and visual stimulus-written response have identical sums. Since there is evidence to indicate that the two remaining methods for tone groups were of a difficult level, the two tasks with the larger sums might represent a possible sequence for the four different methods which would lead from easy to difficult tasks. For intervals and rhythm, however, it would seem that the methods with the greater overall sum would clearly indicate tasks which seemed realistic to all groups regardless of training. Another way of looking at this effect might be that there is one best method for interval learning, one best method for rhythm learning, and two methods for tone group learning to which similar kinds of training transfer.

Table XLI

Summary of Tasks in Which There Was a Significant: Stimulus Effect; Response Effect; or Interaction Effect

	TREATMENT			
	1 Aural Stimulus-Written Response	2 Visual Stimulus-Voice Response	3 Aural Stimulus-Voice Response	4 Visual Stimulus-Written Response
Stimulus	D11-1	D14-4	D16	
Response	E11-1 E12-2	D14-4 F12-2	D16-6	F14-4
Interaction			D16	D18 E17

Table XLII

A Summary of Posttest-Pretest Differences Due to Experimental Treatments in Experiment 1, Intervals.
(Taken from Tables XII to XVI. This is a summary of Category Number 7 in each Table)

Test Tasks Representing The Experimental Methods	Group Receiving Treatment: 1	2	3	4
D11-D1	3.2	1.2	4.9	0.0
D14-D4	0.0	6.6	3.0	1.0
D16-D6	6.0	5.0	6.8	0.0
D18-D8	0.3	0.0	1.6	1.7

Table XLIII

A Summary of Posttest-Pretest Differences Due to Experimental Treatments in Experiment 2, Rhythm.

(Taken from Tables XVII to XXIV. This is a summary of Category Number 7 in each Table)

Test Tasks Representing The Experimental Methods	Group Receiving Treatment: 1	2	3	4
E11-E1	16.3	0.0	1.5	7.4
E12-E2	8.4	.1	0.0	2.2
E13-E3	1.0	1.6	0.0	.1
E14-E4	2.3	1.9	0.6	0.0
E15-E5	1.2	.7	1.2	0.0
E16-E6	0.8	0.0	1.0	0.2
E17-E7	0.2	0.0	1.4	3.7
E18-E8	3.3	0.0	1.0	2.2

Table XLIV

A Summary of Posttest-Pretest Differences Due to Experimental Treatments in Experiment 3, Tone Groups

(Taken from Tables XXV to XXVIII. This is a summary of Category Number 7 in each Table)

Test Tasks Representing The Experimental Methods	**Group Receiving Treatment:** 1	2	3	4
F11-F1	**5.7**	**0.0**	**1.1**	**1.1**
F12-F2	**.4**	**5.3**	**3.4**	**0.0**
F13-F3	**0.0**	**6.4**	**3.7**	**2.4**
F14-F4	**7.6**	**0.0**	**0.2**	**4.7**

The corollary might be, then, that the training involving that method would probably transfer to the other methods. A measure of this may be observed by adding the individual columns in Tables XLII-XLIV. The sum of the column for the group that received treatment 3 for learning intervals is larger than the sum of the column for any other group. This indicates the greater overall improvement on all interval tasks as a result of this experimental treatment. This also coincides with the method to which other kinds of training transfered. The sum for the group that received treatment 1 for learning rhythm is larger than for any other group. This would indicate a greater overall improvement for all rhythm tasks as a result of the experimental treatment. Again the most effective training coincides with the method to which other kinds of training generalized. In the tone group experiment another pattern is in evidence. The group that received treatment 1 shows the greater overall improvement. The larger total was due to the greater improvement on the tasks which required written responses. There was little transfer, however, to the tasks which required voice responses.

The group which received treatment 2 made almost as much overall gain as did the group which received treatment 1. The gain, however, was made on the tasks which required voice responses. Both of these groups show little or no transfer except on the task which required a response identical to the one required in their experimental training. Neither of these treatments coincide with the two methods which had the greater sums. Such data might indicate that the more complex and/or difficult a task is, the more specific the task becomes to the individual. As a result, the individual finds it more difficult to generalize. The transfer that is made, however, might be expected in terms of a similar response pattern rather than in terms of a stimulus similarity.

Summary

This research has investigated the differential effects of aural or visual presentation of basic music materials and written or voice responses. Within the framework of this research new methodology and technology were employed in a controlled laboratory situation with both gratifying and thought-provoking results. Where there were significant effects due to the experimental treatment, the response which students made showed a greater effect than did the stimulus presentation, except in three instances. These patterns varied with the kind of material. The background factors which included various aspects of specific music training as well as general education have some influences upon the students' behavior. Gains have been made, however, toward a better understanding of stimulus-response effects, as well as the development of an improved learning environment for isolated music elements.

Taken together, the data give no support to the position that there is one best treatment unless the particular objective is stated.

Patterns of difference differ with content, that is, intervals, rhythm, and tone groups. For each of these materials, however, if a specific objective is stated a best treatment can be specified with more or less confidence. Tasks differed in difficulty both within and across content classifications. Intervals were of moderate difficulty. Rhythms, except for the treatment 1, were quite easy. Tone groups were very difficult. It is possible that both type of content and degree of difficulty play important roles.

Stimulus mode-response mode interaction appears to play a small part in these differences. Only in the interval and rhythm experimental treatment of visual stimulus-written response does it appear as the only effect. Stimulus mode appears as an important effect only for intervals, the moderately difficult content. Response mode is important in both moderately and very difficult tasks. It appears that what the students do may be more important than the manner in which the tasks are presented, especially when the task is a difficult one.

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Appendices

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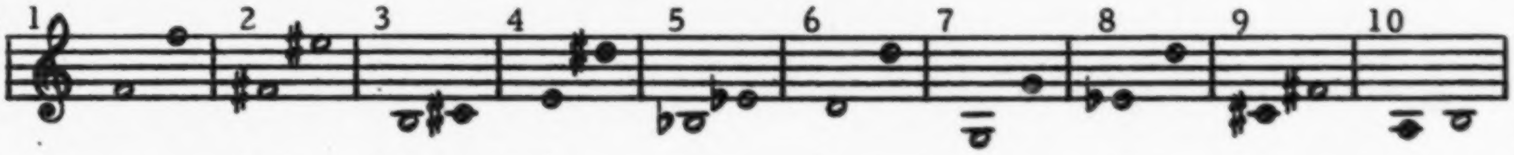
APPENDIX A

INTERVAL INSTRUCTIONAL MATERIAL

INTERVAL STUDY PHASE I

P8-M2-M7-P4 O. E. # 7-45-0430-172.0 Set I - 10B

A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P8 M7 M2 M7 P4 P8 P8 M7 P4 M2

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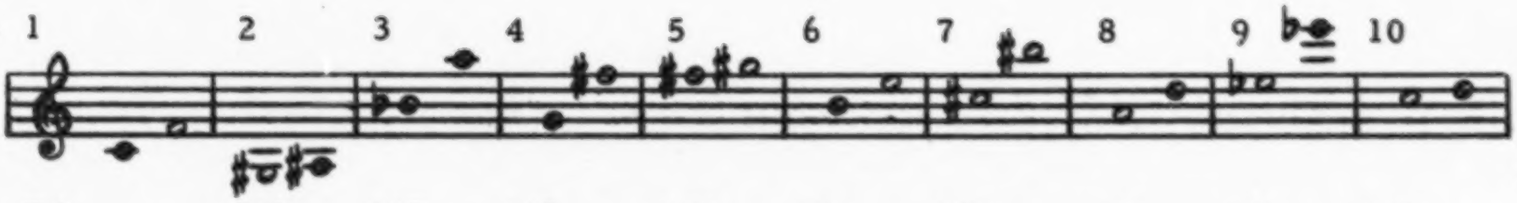
M7	3
M2	2
P4	2

B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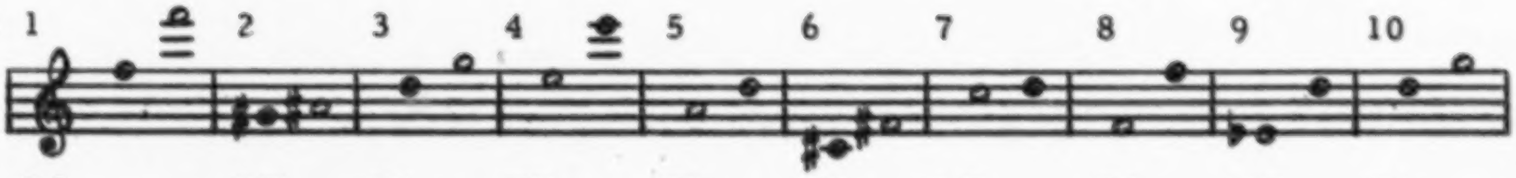
P4 M2 M7 M7 M2 P4 M7 P4 P8 M2

P8	1
M7	3
M2	3
P4	3

C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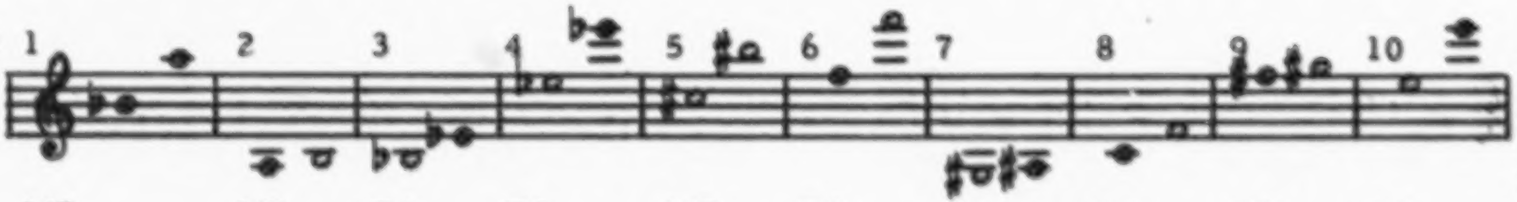
M7	1
M2	2
P4	4

D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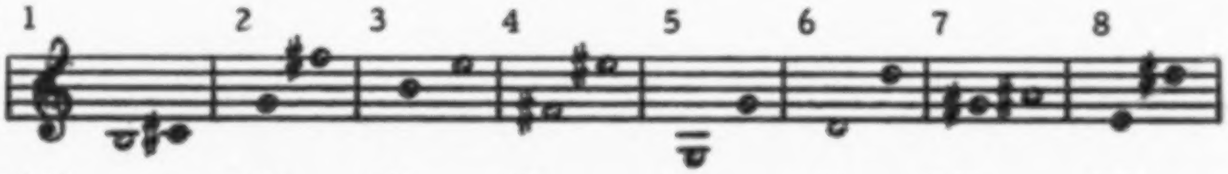
M7	2
M2	3
P4	2

E



M2 M7 P4 M7 P8 P8 M2 M7

P8	2	12
M7	3	12
M2	2	12
P4	1	12

INTERVAL STUDY PHASE I
O. E. # 7-45-0430-172. 0

m2-M3-T-M6

Set II - 20B

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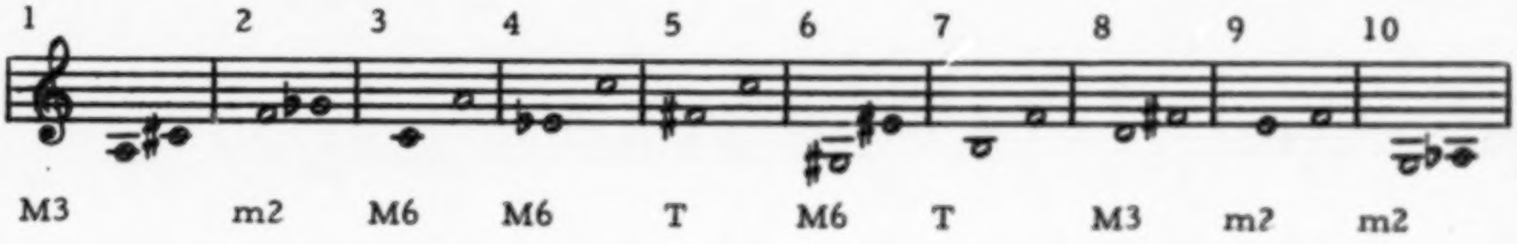
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M6
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M3
m2
m2

m2 3
M3 2
T 2
M6 3

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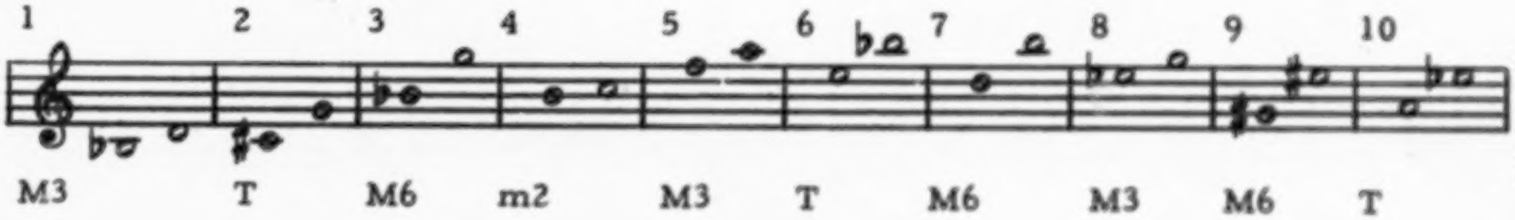
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T

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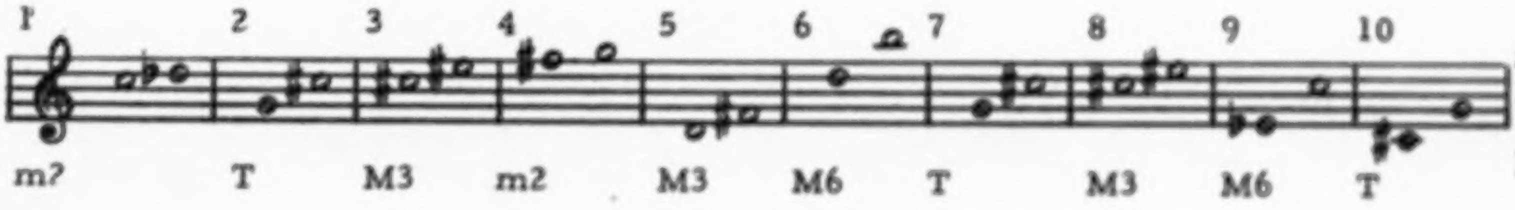
M3 3
T 3
M6 3

C

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M6
T

m2 2
M3 3
T 3
M6 2

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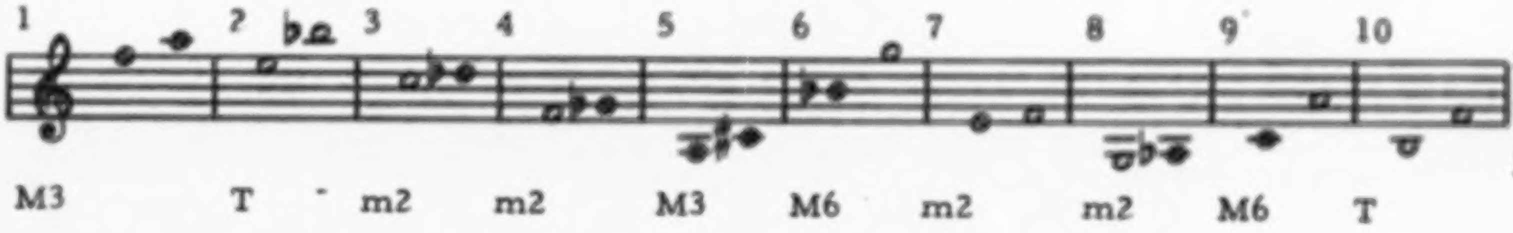
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T

m2 4
M3 2
T 2
M6 2

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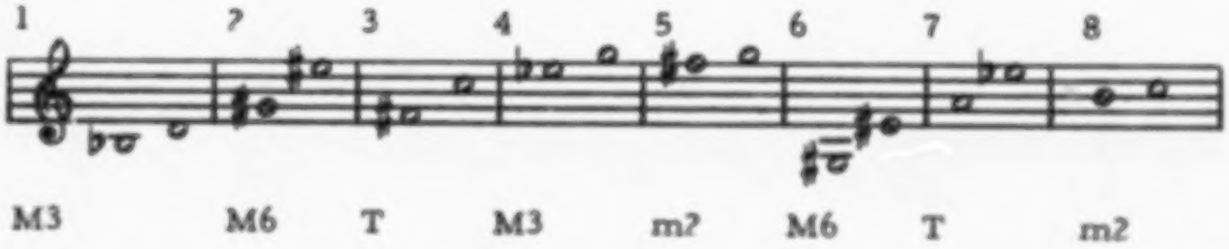
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M3
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M3
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m2

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M3	2	12
T	2	12
M6	2	12

INTERVAL STUDY PHASE I
O. E. # 7-45-0430-172.0

m3-P5-m6-m7

Set III - 30B

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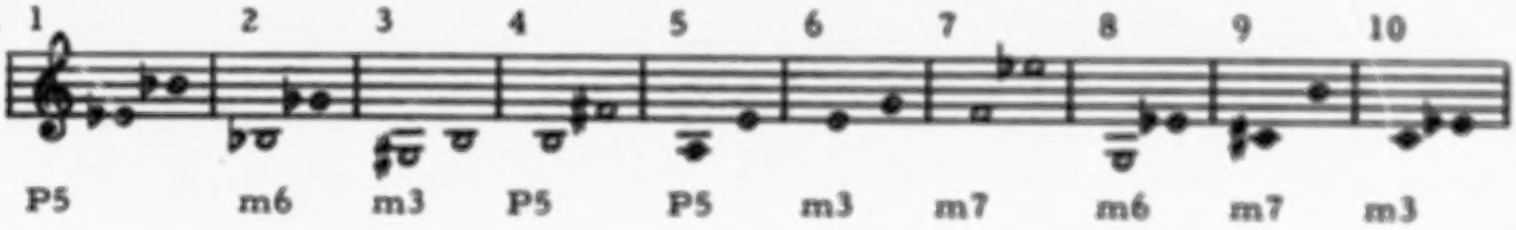
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P5 m6 m3 P5 P5 m3 m7 m6 m7 m3

m3 3
P5 3
m6 2
m7 2

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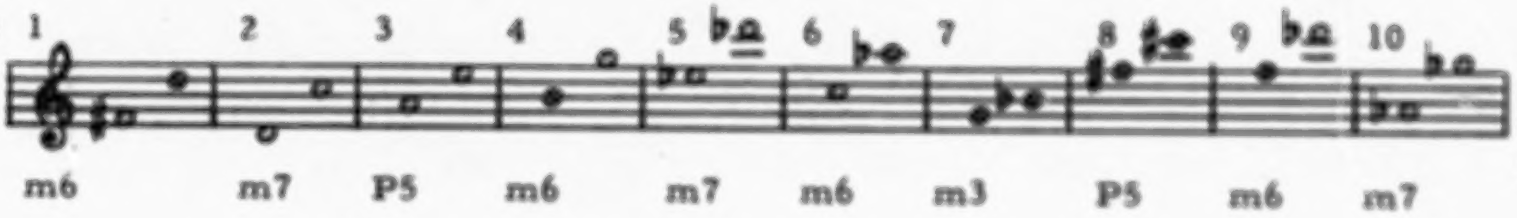
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m3
P5 2
m6 4
m7 3

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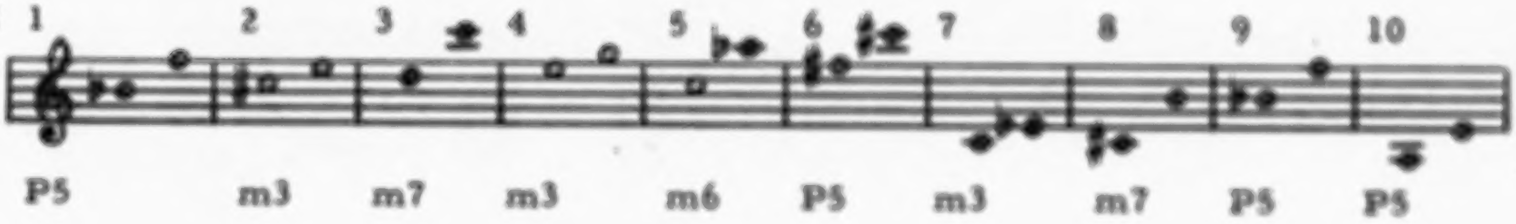
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P5 4
m6 1
m7 2

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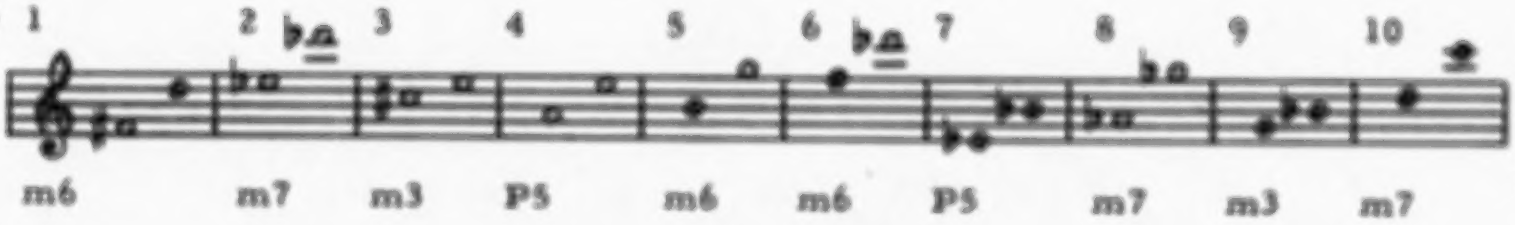
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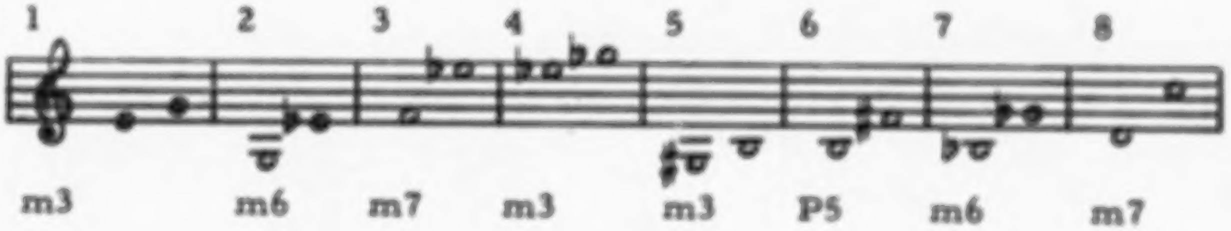
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P5	1	12
m6	2	12
m7	2	12

INTERVAL STUDY PHASE I

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m2-M2-M3-P4-M7-P8

Set IV - 40B

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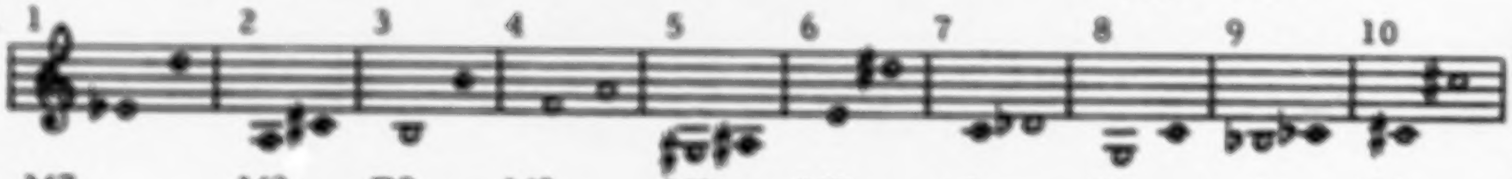
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P8

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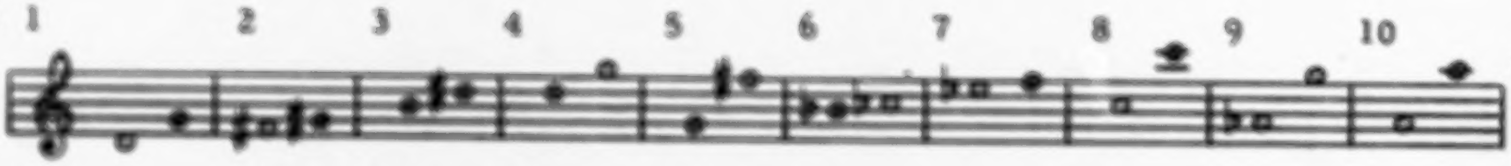
M3	2
P4	1
M7	2
P8	2

B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m2
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M7
P8

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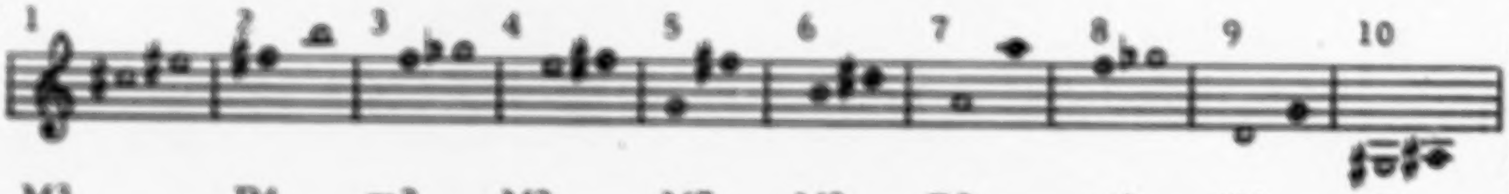
M2	2
M3	1
P4	2
M7	2
P8	2

C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P4
M2

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M2	2
M3	2
P4	2
M7	1
P8	1

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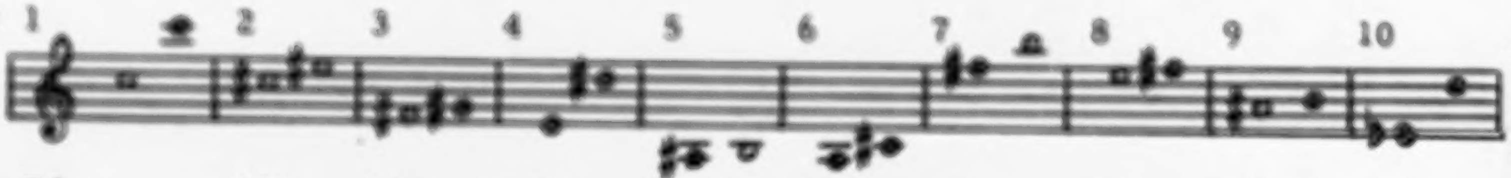
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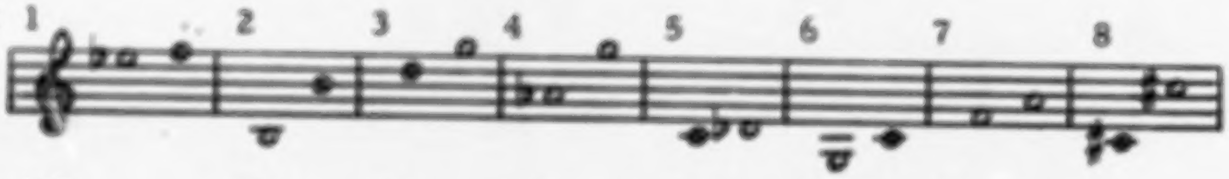
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M3
P8

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M2	1	8
M3	1	8
P4	2	8
M7	1	8
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INTERVAL STUDY PHASE I
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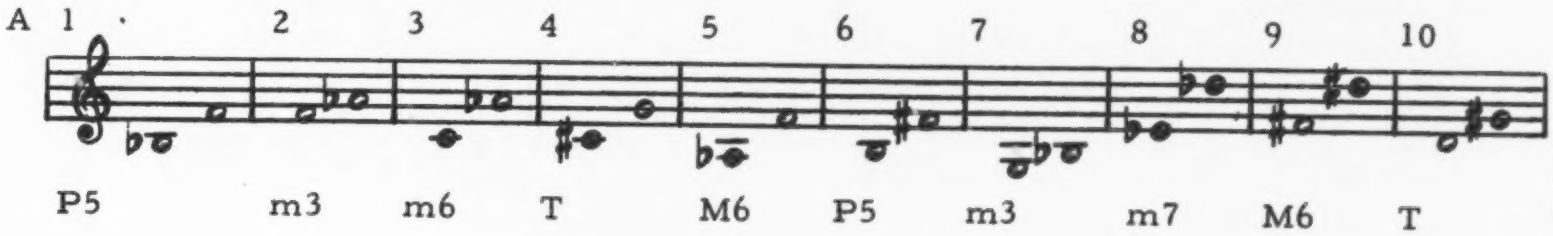
Set V - 50B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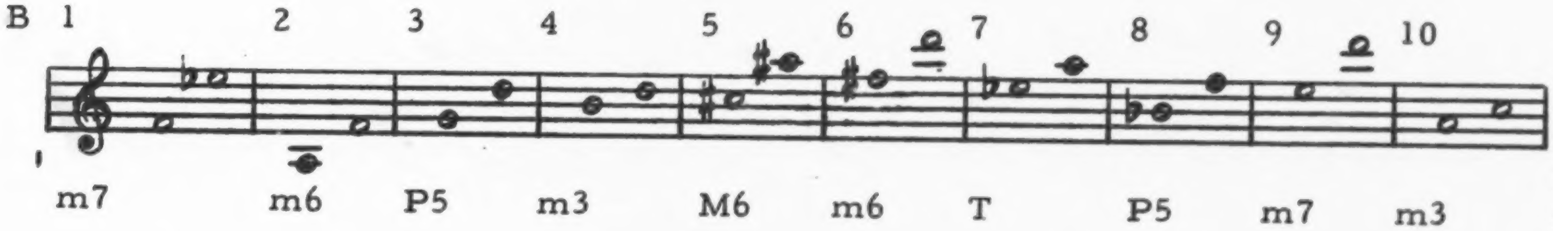
P5 2
m6 1
M6 2
m7 1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m7 m6 P5 m3 M6 m6 T P5 m7 m3

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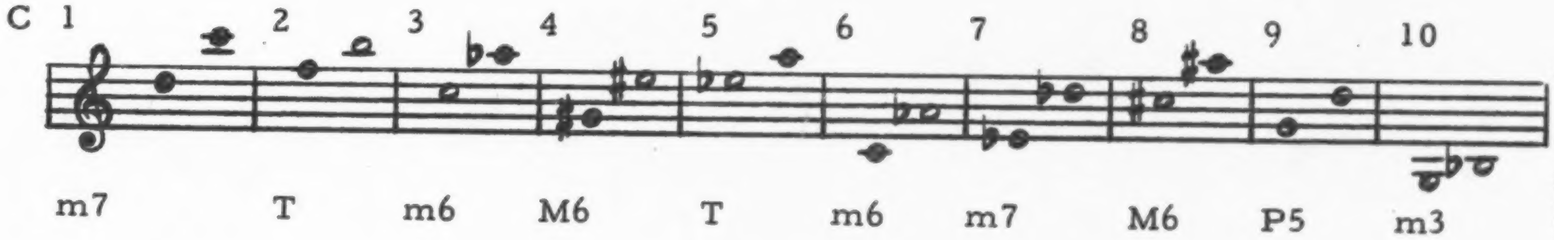
T 1
P5 2
m6 2
M6 1
m7 2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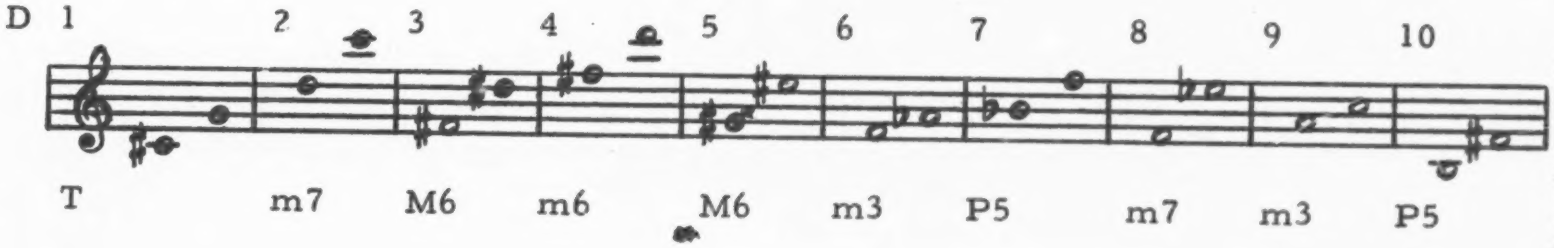
T 2
P5 1
m6 2
M6 2
m7 2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m6 1
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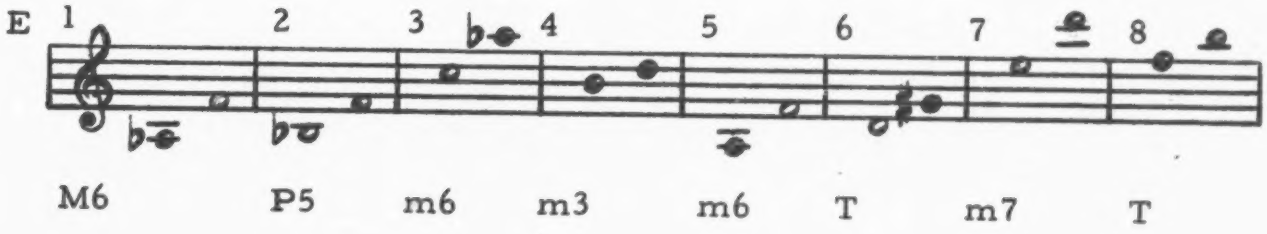
m7 2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M6 P5 m6 m3 m6 T m7 T

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T	2	8
P5	1	8
m6	2	8
M6	1	8
m7	1	8

INTERVAL STUDY PHASE I

O. E. # 7-45-0430-172. 0

m2-M2-m3-M3-P4-T-P5-m6-M6-m7-M7-P8

Set VI - 60B

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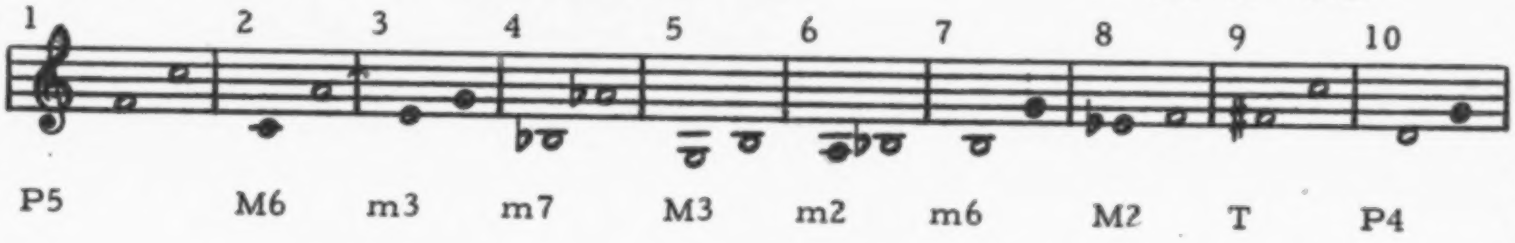
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P4

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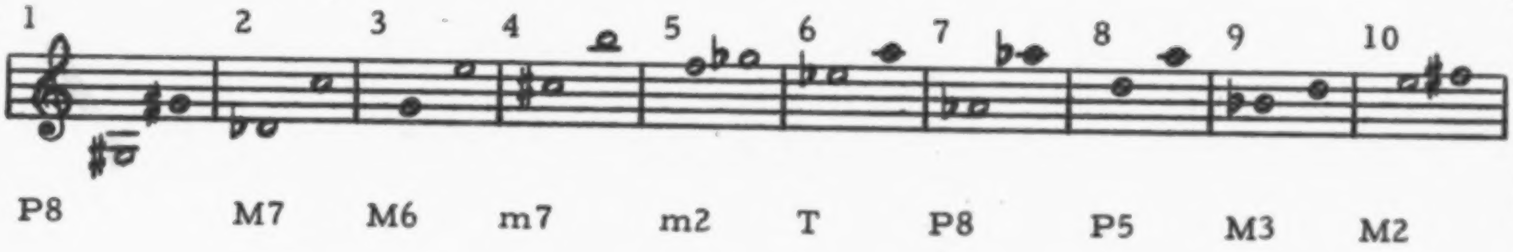
m6	1
M6	1
m7	1

B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m2
T
P8
P5
M3
M2

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T	1
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M6	1
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M7	1
P8	2

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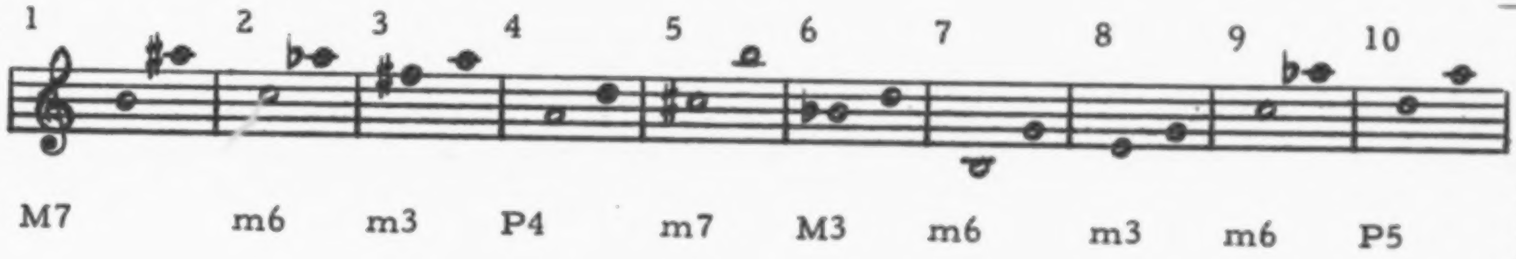
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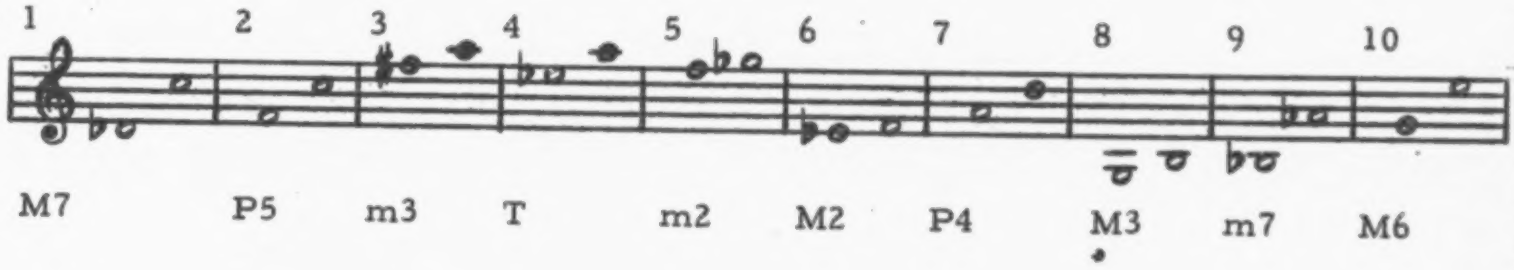
m7
M3
m6
m3
m6
P5

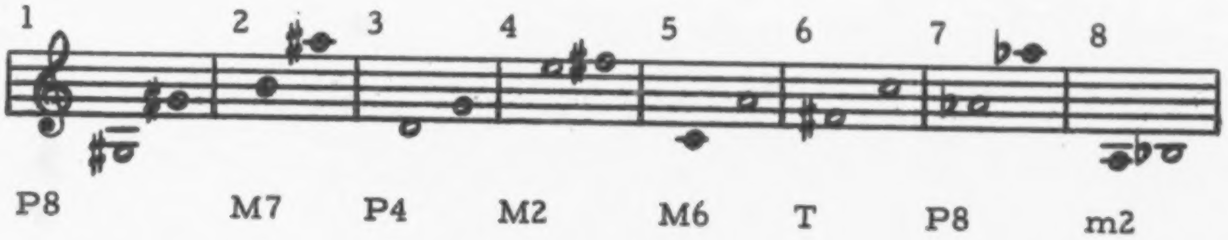
m3	2
M3	1
P4	1
P5	1
m6	3
m7	1
M7	1

D


1
2
3
4
5
6
7
8
9
10
M7
P5
m3
T
m2
M2
P4
M3
m7
M6

m2	1
M2	1
m3	1
M3	1
P4	1
T	1
P5	1
M6	1
m7	1
M7	1

E


1
2
3
4
5
6
7
8
P8
M7
P4
M2
M6
T
P8
m2

m2	1	4
M2	1	4
m3	0	4
M3	0	4
P4	1	4
T	1	4
P5	0	4
m6	0	4
M6	1	4
m7	0	4
M7	1	4
P8	2	4

APPENDIX B

INTERVAL TESTS

INTERVAL TEST #2

Additional Instructions

#1

Here is a complete list of the symbols to be used in this test:

m2, M2, m3, M3, P4, T (tritone), P5, m6, M6,
m7, M7, P8

Be sure your "capital M" is large and square and your "small m" is small and rounded.

For your practice make a "capital M"

Now write a "small m"

Now following the instructions on the tape.

(After the interval is played, write your answer in the upper box.)

Example

"You should have written:"

P8

NAME________________________________ TITLE______________

COURSE________ INSTRUCTOR________________ DATE______________

A 1 2 3 4 5 6 7 8 9 10

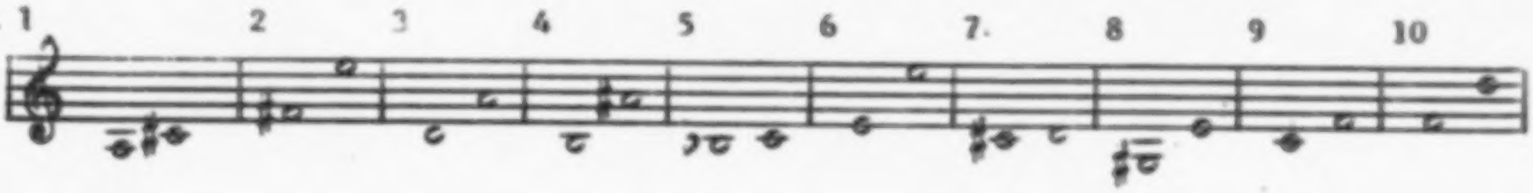
B 1 2 3 4 5 6 7 8 9 10

C 1 2 3 4 5

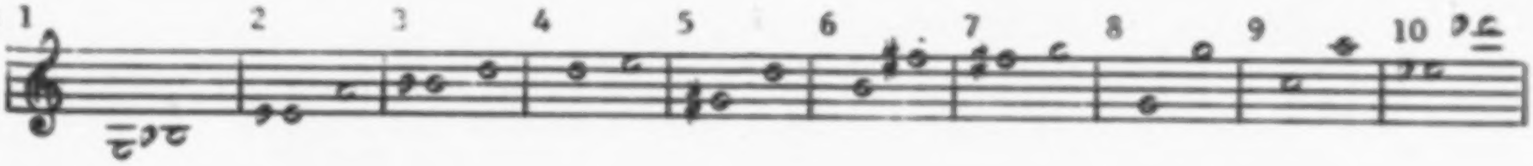
NAME____ TITLE Interval Test D11

COURSE____________________ INSTRUCTOR__________ DATE________________

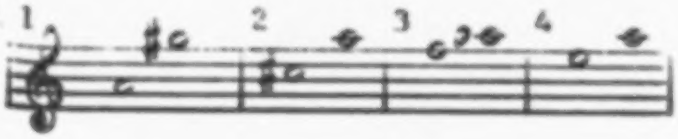
A


1
2
3
4
5
6
7.
8
9
10

B


1
2
3
4
5
6
7
8
9
10

C.



INTERVAL TEST

Instructions for Section 4.

Begin tape and follow these instructions.

In this part of the test you are asked to look at the notation. You will hear the lower note sounded on the piano. In your vocal range think the upper note. All of the sounds that you hear and all of the singing that you do will be in tempo. On the tape you will hear "Now sing and identify". At that moment, sing with the neutral syllable "lu" the lower note and the upper note indicated by the notation. You may wish to change the octave to suit your vocal range. As soon as you sing, give the symbolic name of the interval in this fashion: minor 2, Major 2, minor 3, Major 3, Perfect 4, Tritone, Perfect 5, minor 6, Major 6, minor 7, Major 7, Perfect 8. Now, a practice interval.

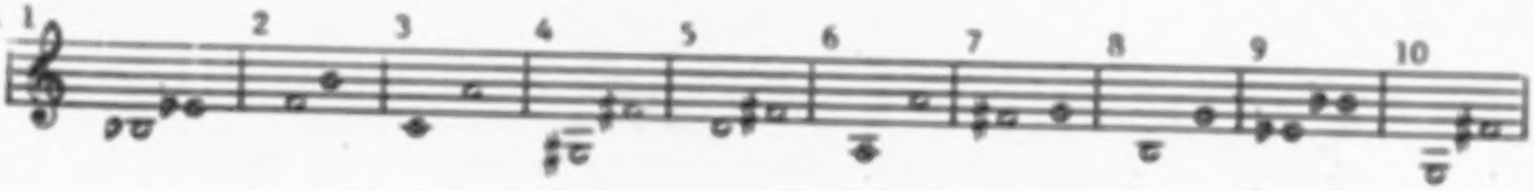
Example

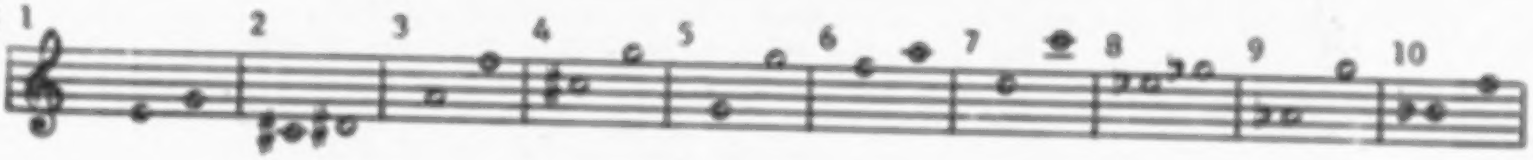
Now sing and identify.

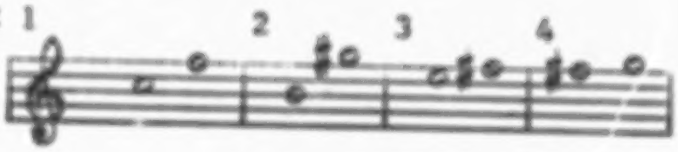
You should have sung a Perfect 8 and identified it as such.

NAME____ TITLE Interval Test D14

COURSE________________ INSTRUCTOR________________ DATE________________

A

1
2
3
4
5
6
7
8
9
10

B

1
2
3
4
5
6
7
8
9
10

C


Instructions for Section 6.

In this part of the test you again are asked to look at the notation. You will hear the upper note sounded on the piano. In your vocal range, think the lower note. All of the sounds that you hear and the singing that you do will be in tempo. On the tape you will hear "Now sing and identify". At that moment, sing with the neutral syllable "lu" the upper and lower note indicated by the notation. You may wish to change the octave to suit your vocal range. As soon as you sing, give the symbolic name of the interval as you did in the preceeding section. Now an example.

Example

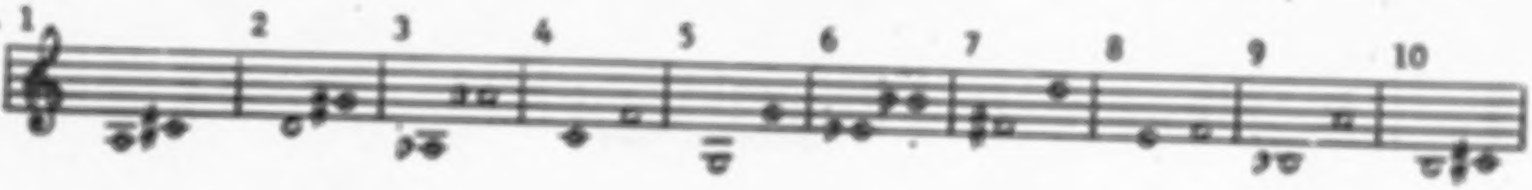
Now sing and identify.

You should have sung a perfect octave down and identified it as such.

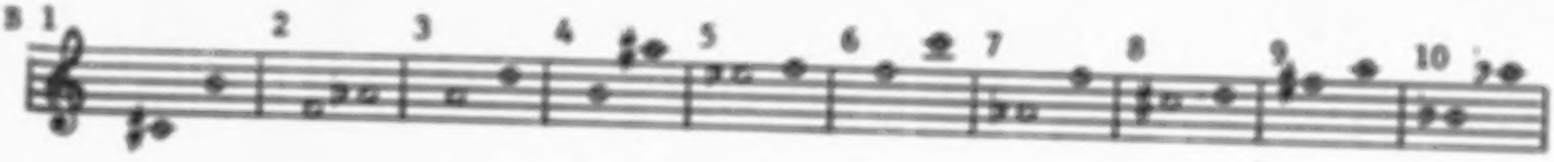
NAME________________________________ TITLE Interval Test D16

COURSE______________ INSTRUCTOR______________ DATE______________

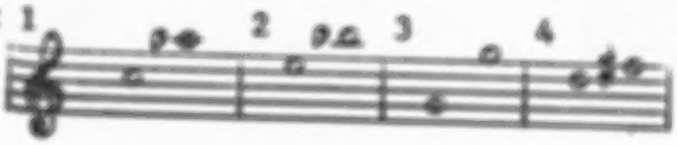
A


1
2
3
4
5
6
7
8
9
10

B


1
2
3
4
5
6
7
8
9
10

C

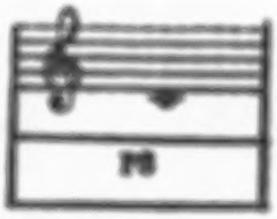


INTERVAL TEST

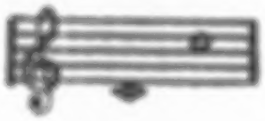
#8

(After "answer now", write the correct note on the staff).

Example:

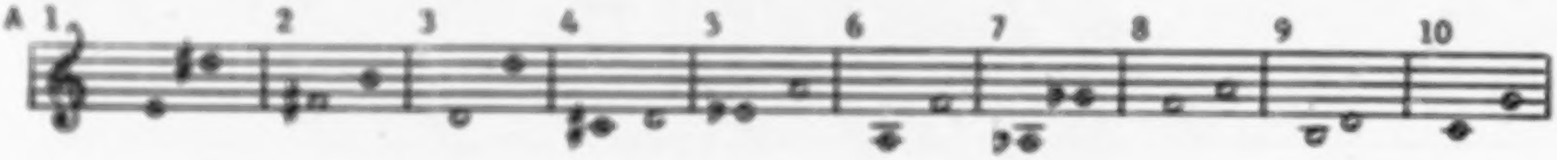


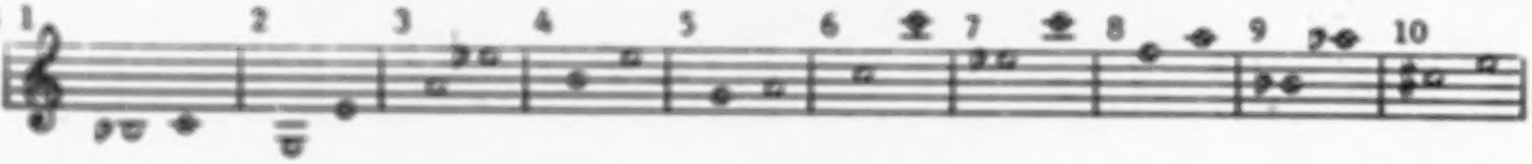
"You should have written:"

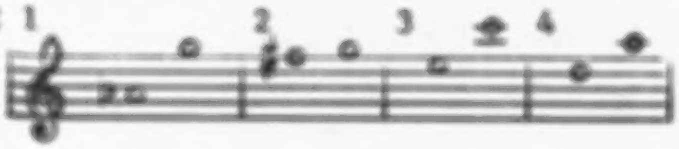


NAME____ TITLE Interval Test D18

COURSE__________________ INSTRUCTOR__________________ DATE__________________

A

1
2
3
4
5
6
7
8
9
10

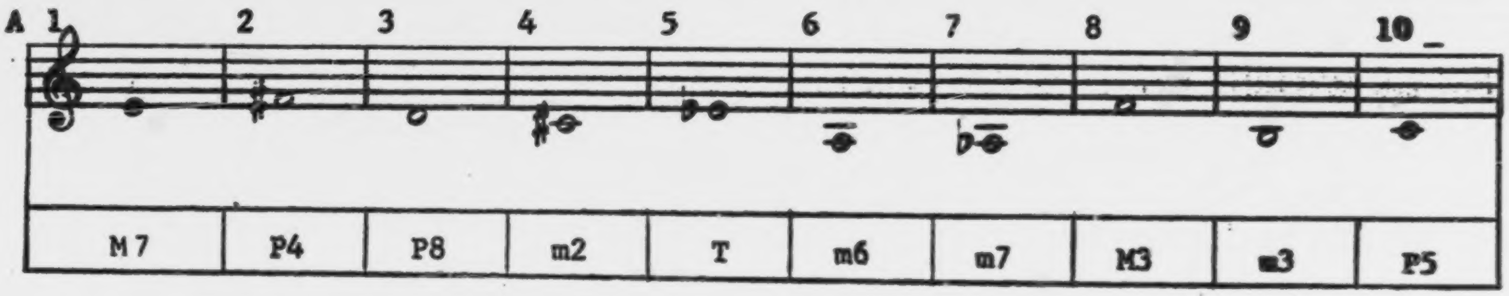
B

1
2
3
4
5
6
7
8
9
10

C


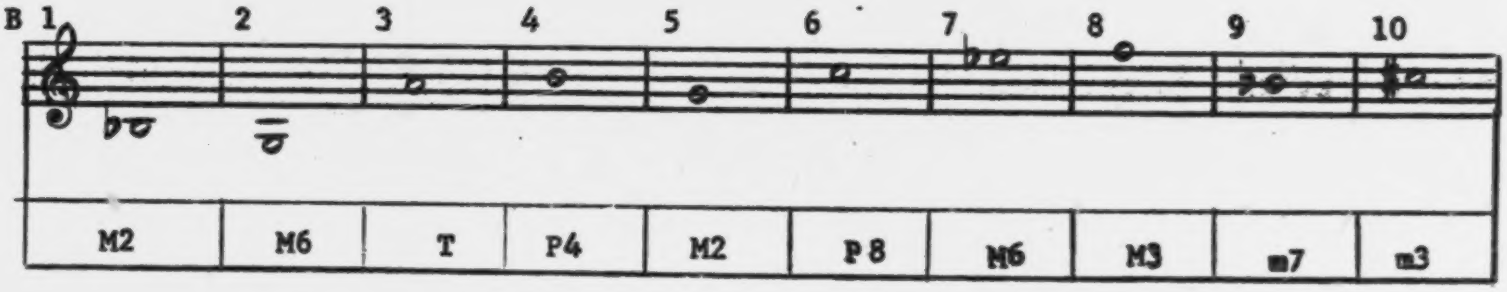
NAME________________________________ TITLE______________

COURSE________INSTRUCTOR______________ DATE______________

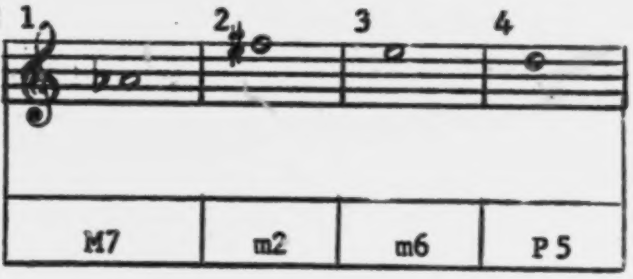
A


1
2
3
4
5
6
7
8
9
10
M7
P4
P8
m2
T
m6
m7
M3
m3
P5

B


1
2
3
4
5
6
7
8
9
10
M2
M6
T
P4
M2
P8
M6
M3
m7
m3

C


1
2
3
4
M7
m2
m6
P5

3

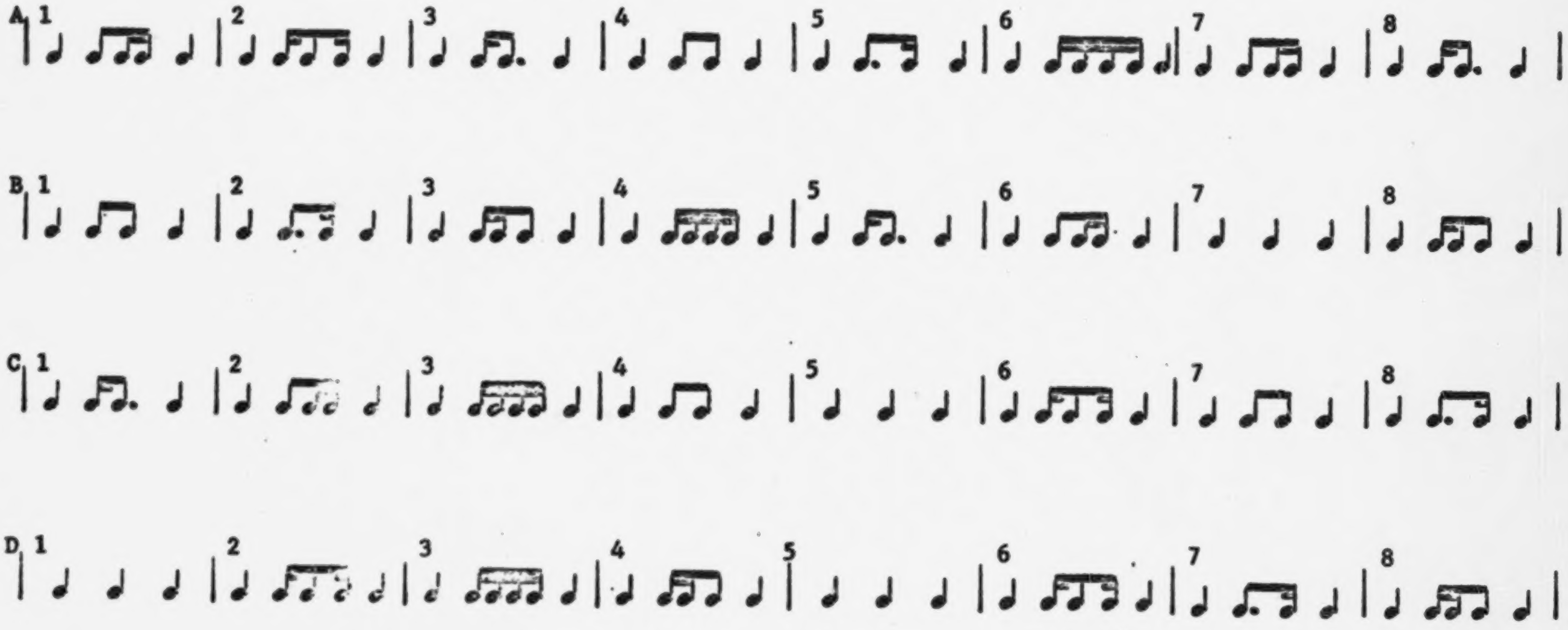
APPENDIX C

RHYTHM INSTRUCTIONAL MATERIAL

RHYTHM STUDY PHASE II

O.E. # 7-45-0430-172.0

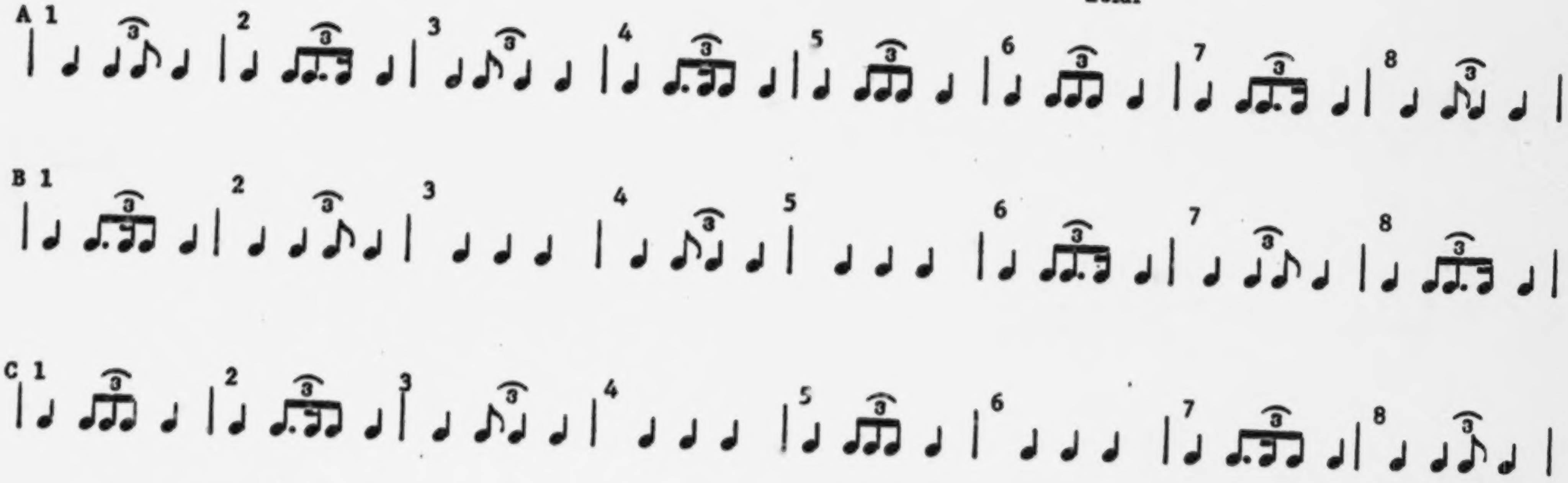
10RA


A
B
C
D
1
2
3
4
5
6
7
8

RHYTHM STUDY PHASE II

O.E. # 7-45-0430-172.0

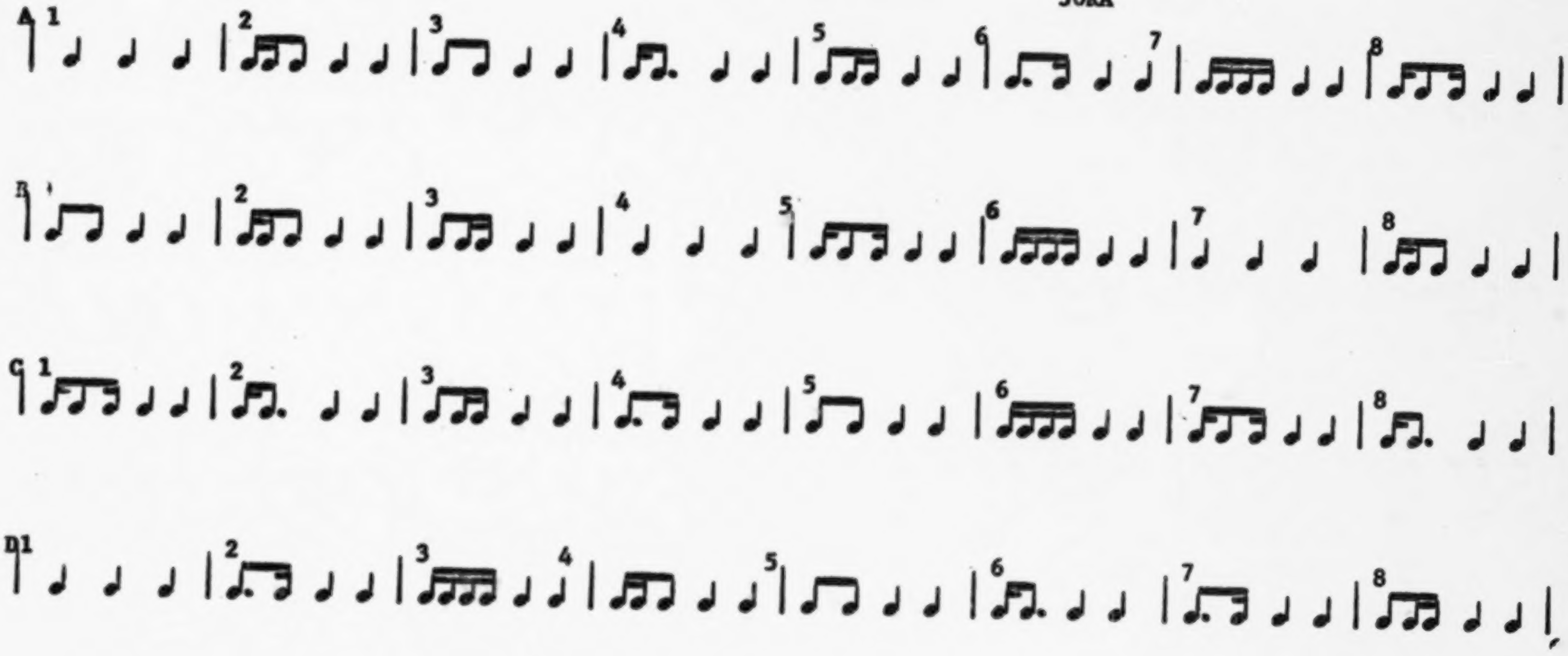
20RA


A
B
C
1
2
3
4
5
6
7
8
3

RHYTHM STUDY PHASE II

O.E. # 7-45-0430-172.0

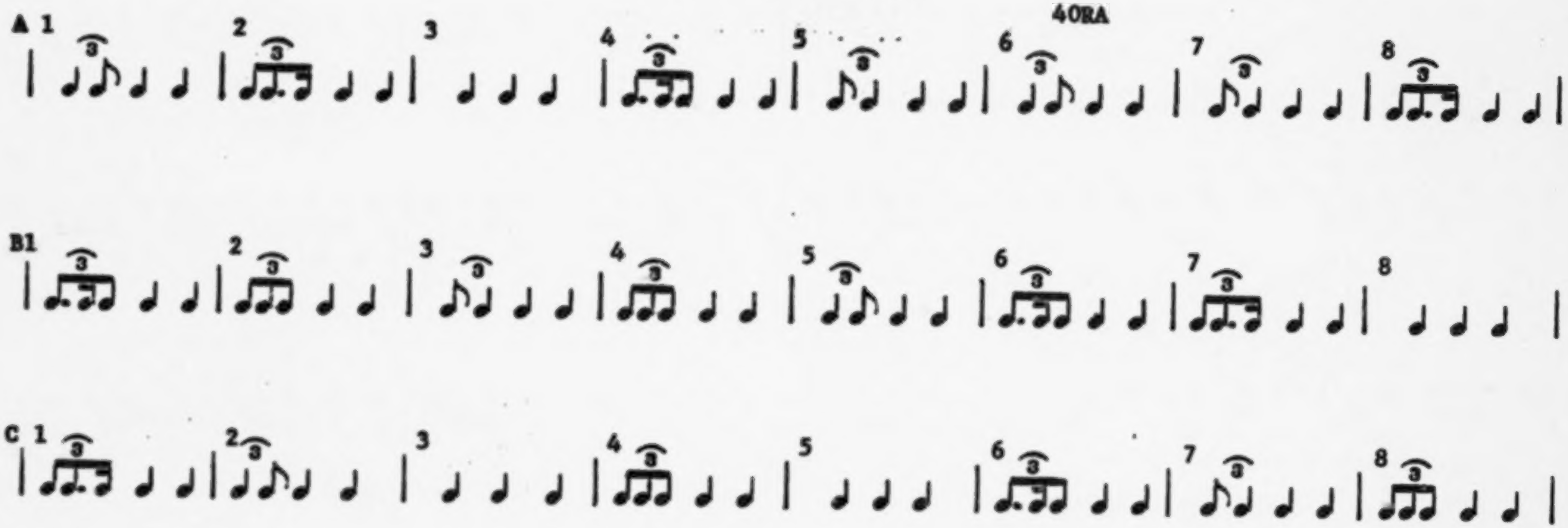
30RA



RHYTHM STUDY PHASE II

O.E. # 7-45-0430-172.0

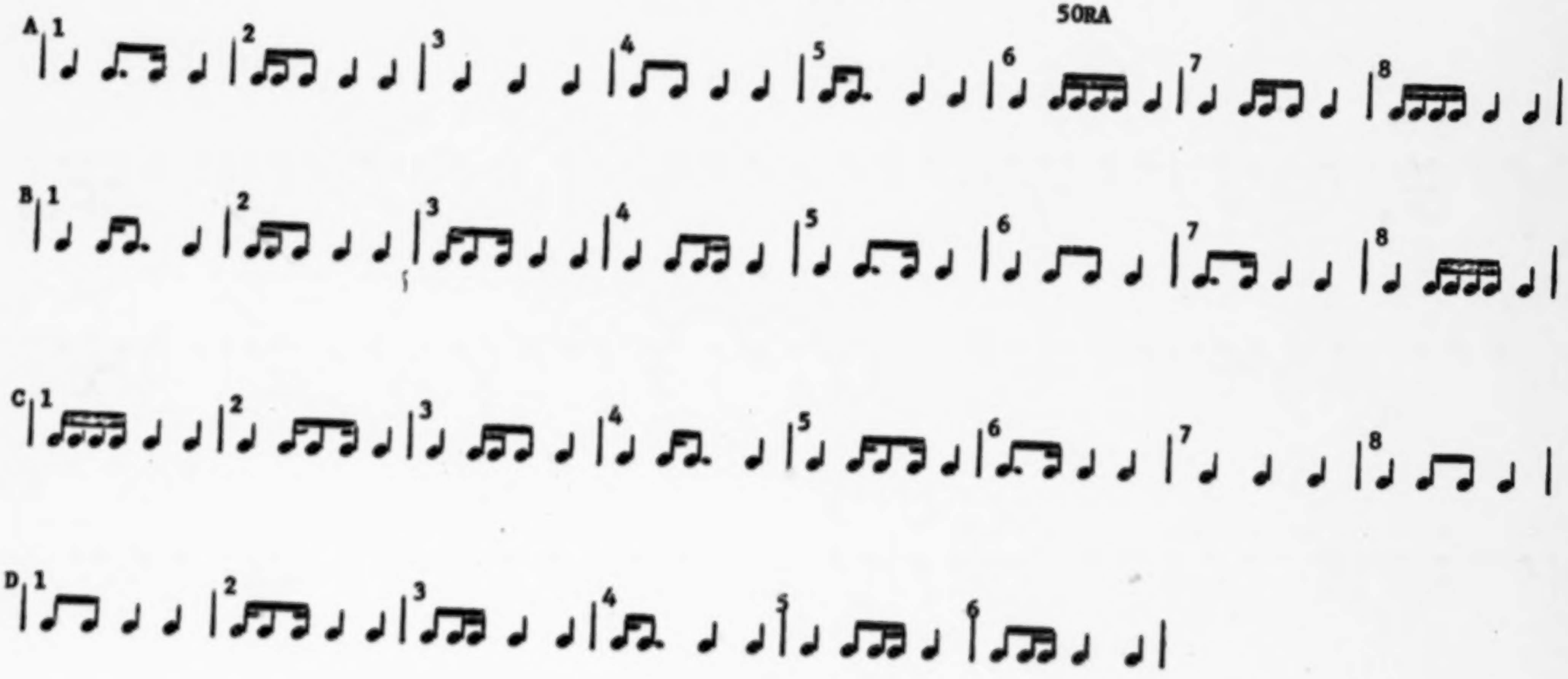
40RA


A 1
2
3
4
5
6
7
8
B1
2
3
4
5
6
7
8
C 1
2
3
4
5
6
7
8

RHYTHM STUDY PHASE II

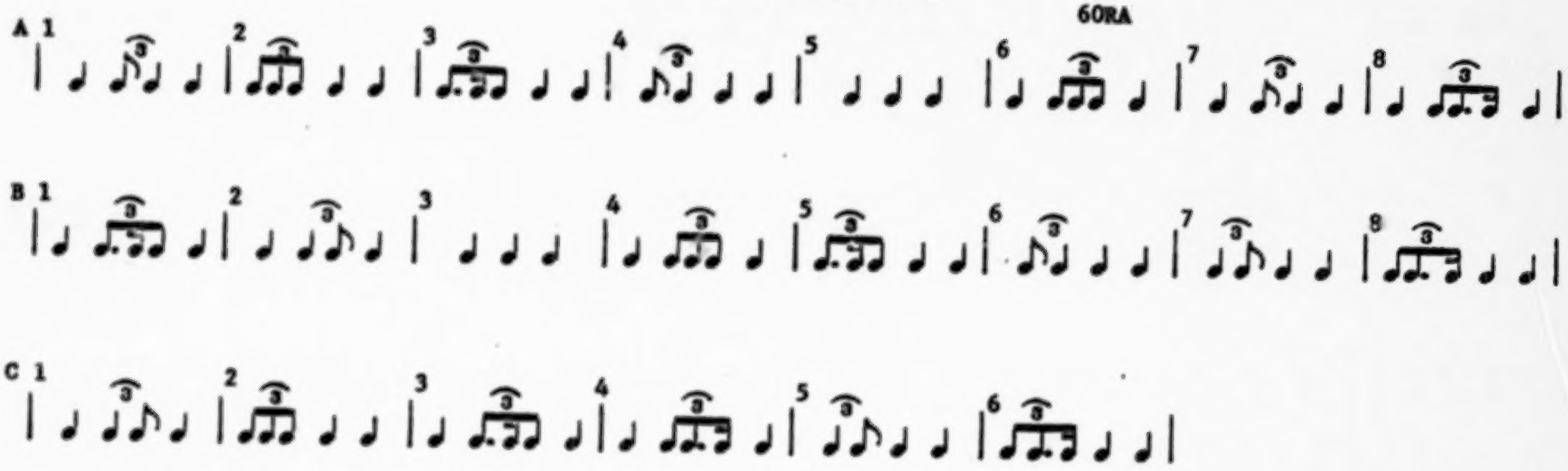
O.E. # 7-45-0430-172.0

50RA


A
1
2
3
4
5
6
7
8
B
1
2
3
4
5
6
7
8
C
1
2
3
4
5
6
7
8
D
1
2
3
4
5
6

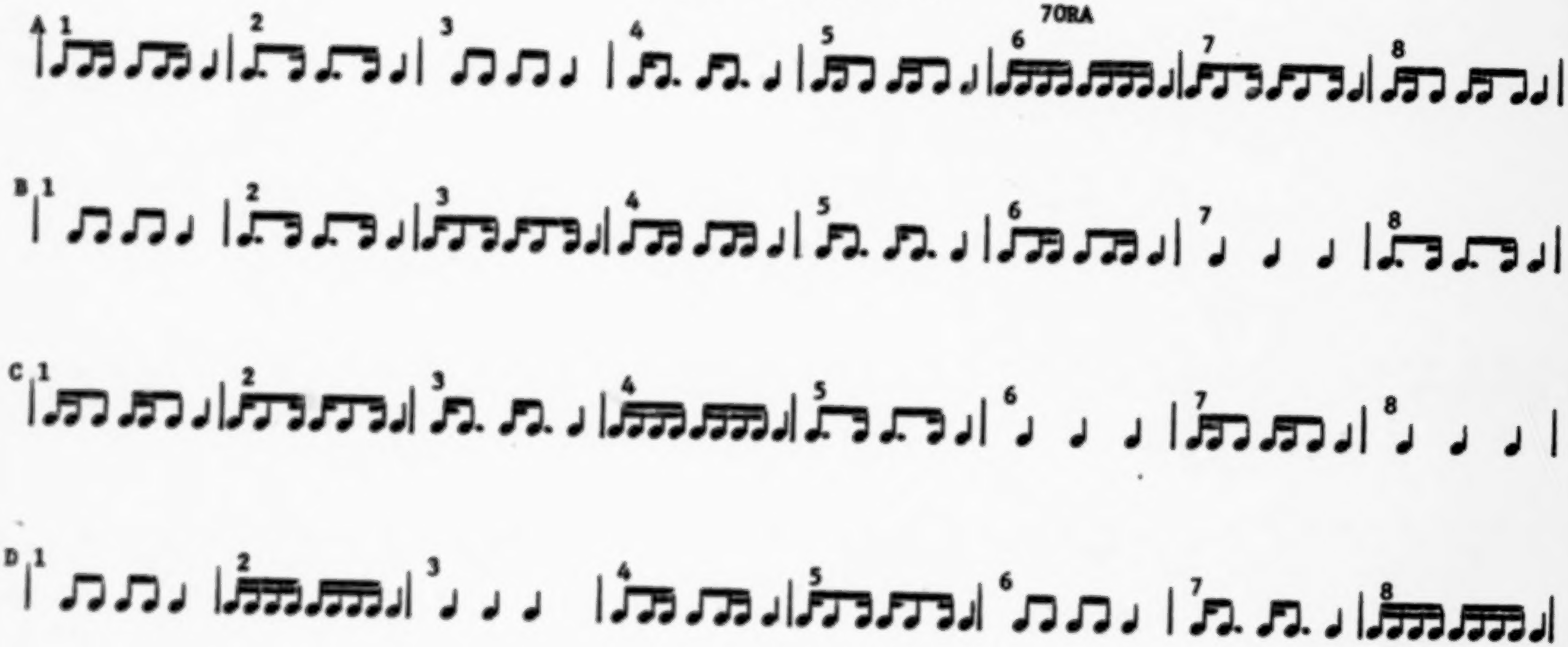
RHYTHM STUDY PHASE II

O. E. # 7-45-0430-172.0


60RA
A
B
C
1
2
3
4
5
6
7
8
3

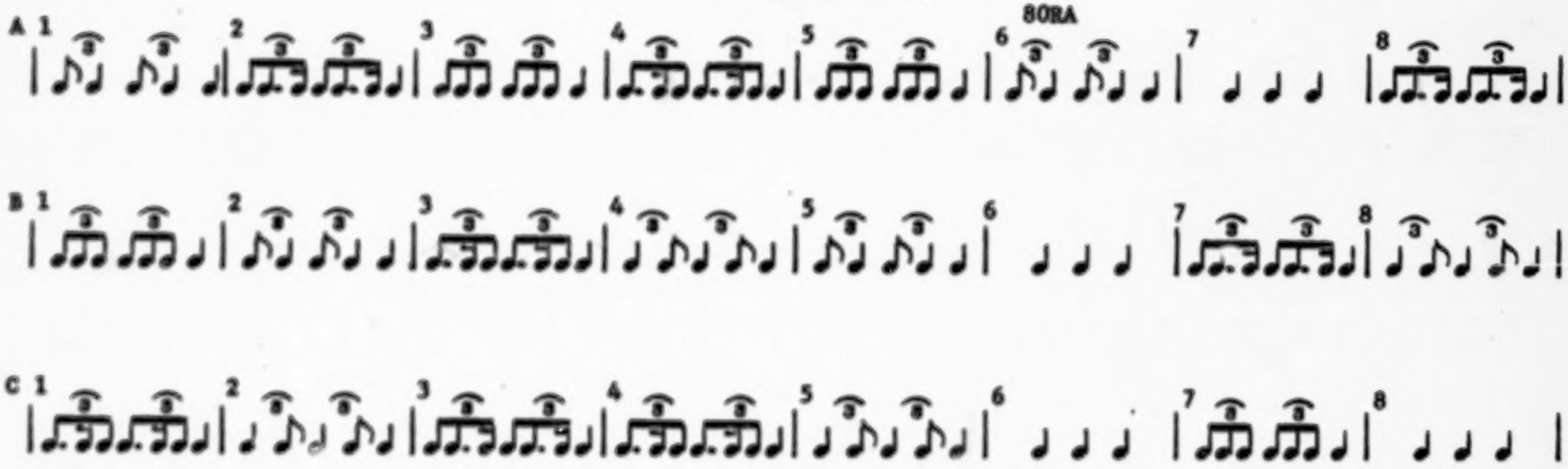
RHYTHM STUDY PHASE II

O. E. # 7-45-0430-172.0


7ORA
A
B
C
D
1
2
3
4
5
6
7
8

RHYTHM STUDY PHASE II

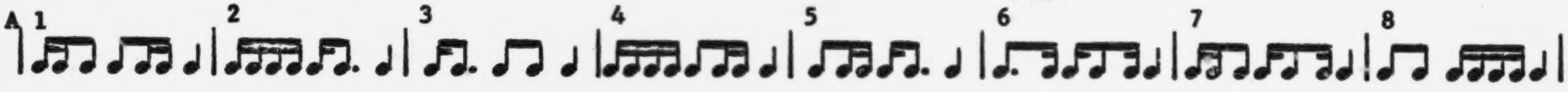
O. E. # 7-45-0430-172.0

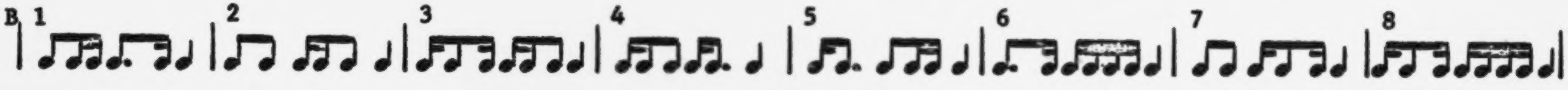

80RA
A
B
C
1
2
3
4
5
6
7
8
3

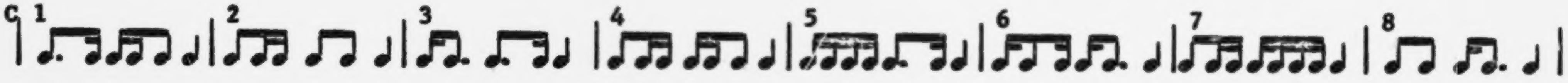
RHYTHM STUDY PHASE II

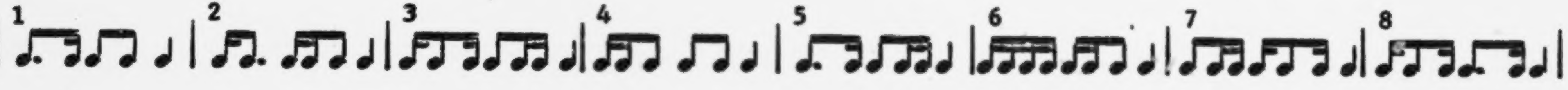
O. E. # 7-45-0430-172.0

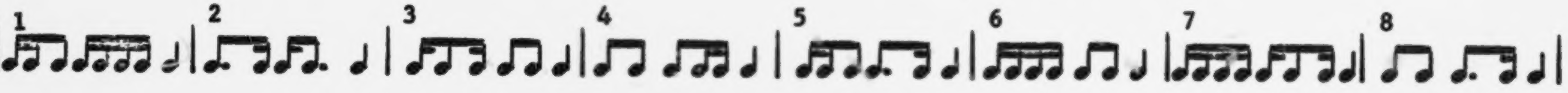
90RA

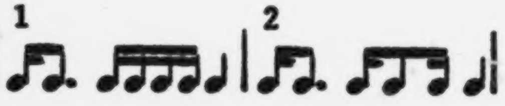
A


B


C


D


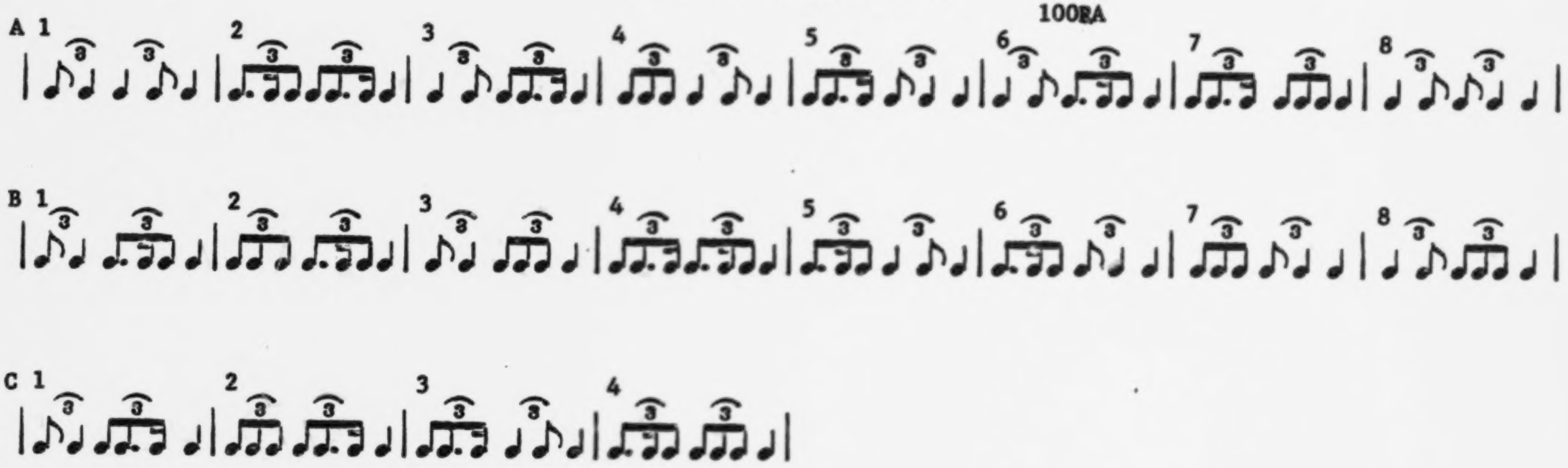
E


F


RHYTHM STUDY PHASE II

O. E. # 7-45-0430-172.0

100RA


A
1
2
3
4
5
6
7
8
B
1
2
3
4
5
6
7
8
C
1
2
3
4

APPENDIX D

RHYTHM TESTS

INSTRUCTION SHEET

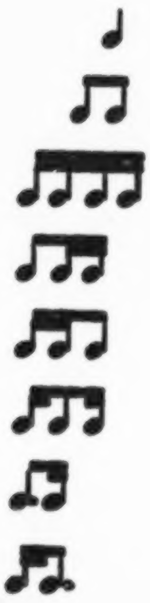
Rhythm Test

Read before playing tape.

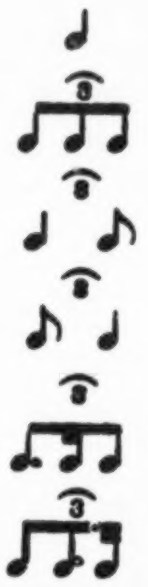
Instructions on the tape will give you most of the information necessary for taking this test. Write your answer in the upper box under the correct number of the example.

The following rhythms will be presented on this test. Each test item contains the equivalent of three quarter notes and the last note is always a quarter note. Be sure to mark all triple rhythms with a bracket. Be as accurate as possible. Indicate all dots, stems, flags, and note heads.

Column A



Column B



Now begin tape and follow these instructions.

This is a test of your ability to identify rhythms presented to you in different ways. In the first part of the test you are asked to write on a piece of paper the rhythmic notation that will be sounded for you on the piano. All rhythms are played on the same tone. There are only duple rhythms included in the first two pages of the test. Your printed instruction sheet lists those rhythms in column A. There are only triple rhythms included on the third page. Those rhythms are listed in column B. You will hear the rhythm. It will be played for you only once. You will be given four seconds to write the rhythm. If you do not know, guess. Do NOT leave any blanks. Write something in each box if only three quarter notes. Here is an example of the procedure:

Example:

You should have written in notation: quarter, quarter, quarter (♩ ♩ ♩).

NAME____________________ TITLE__________ NO.________

COURSE__________ INSTRUCTOR__________ DATE__________ BOOTH________

A 1	2	3	4	5	6	7	8

B 1	2	3	4	5	6	7	8

C 1	2	3	4	5	6	7	8

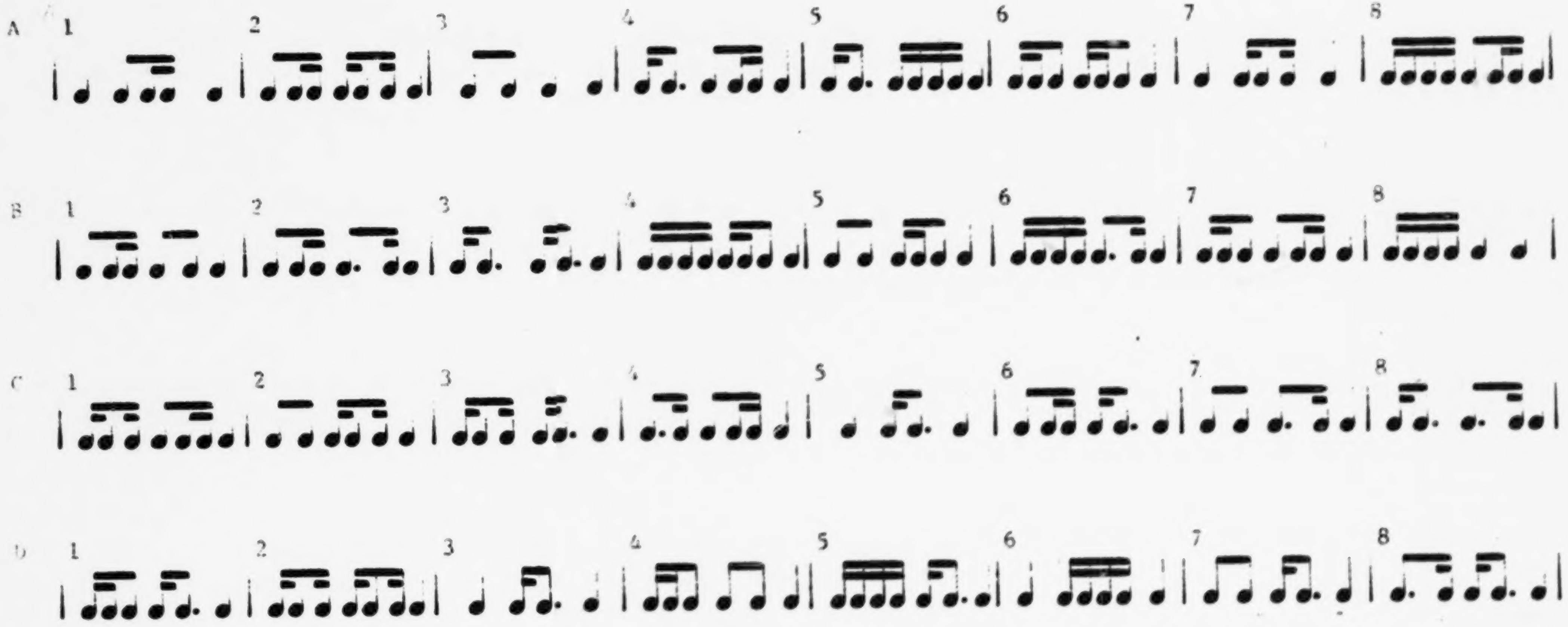
D 1	2	3	4	5	6	7	8

E 1	2	3	4	5	6	7	8

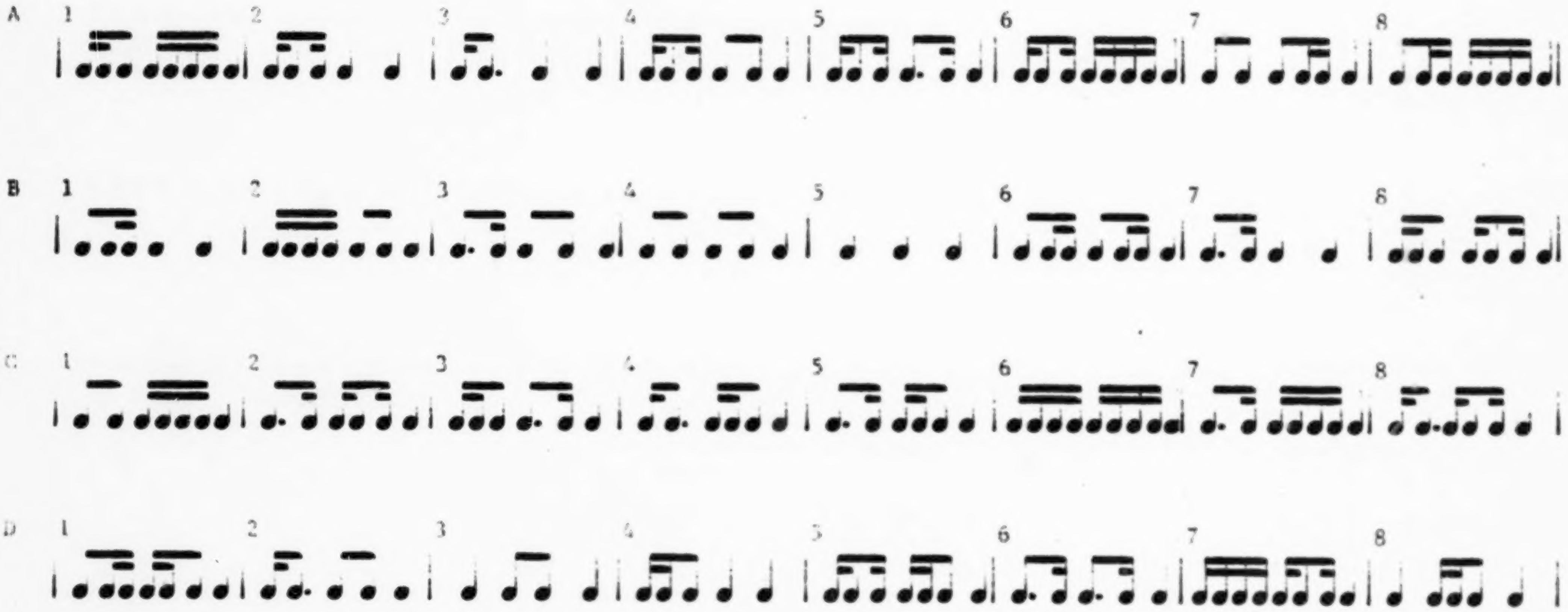
F 1	2	3	4	5	6	7	8

RF 1-62

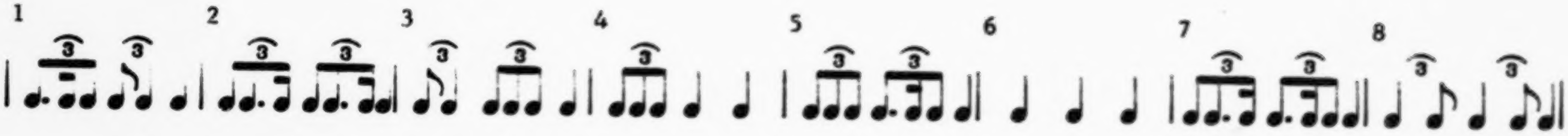
Rhythm Test 1 Section A1

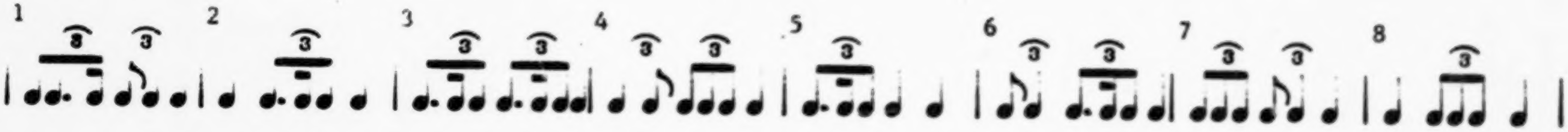

A
1
2
3
4
5
6
7
8
B
1
2
3
4
5
6
7
8
C
1
2
3
4
5
6
7
8
D
1
2
3
4
5
6
7
8

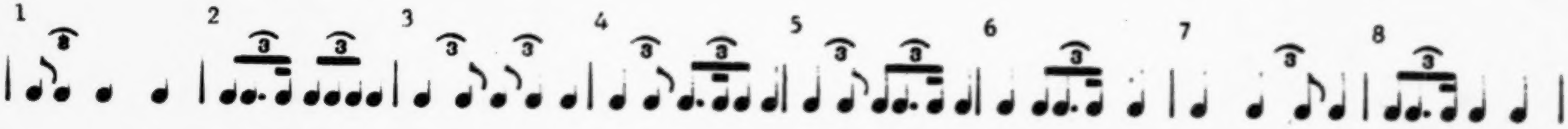
Rhythm Test 1 Section A_2

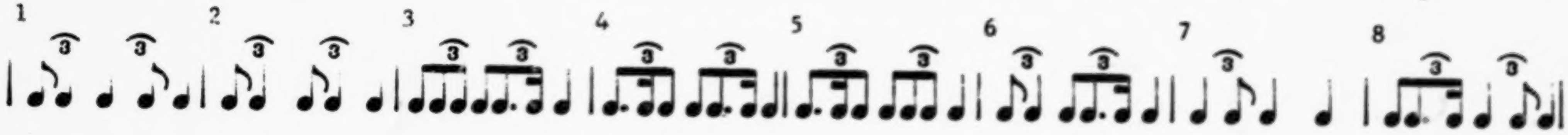

A
1
2
3
4
5
6
7
8
B
1
2
3
4
5
6
7
8
C
1
2
3
4
5
6
7
8
D
1
2
3
4
5
6
7
8

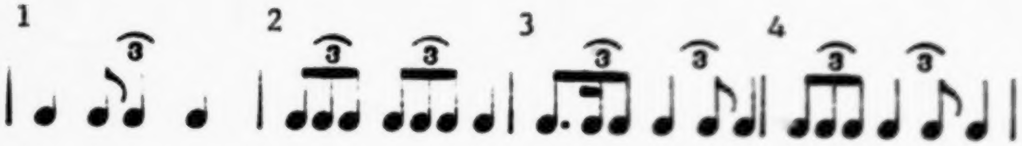
Rhythm Test 1 Section B

A


B


C


D


E


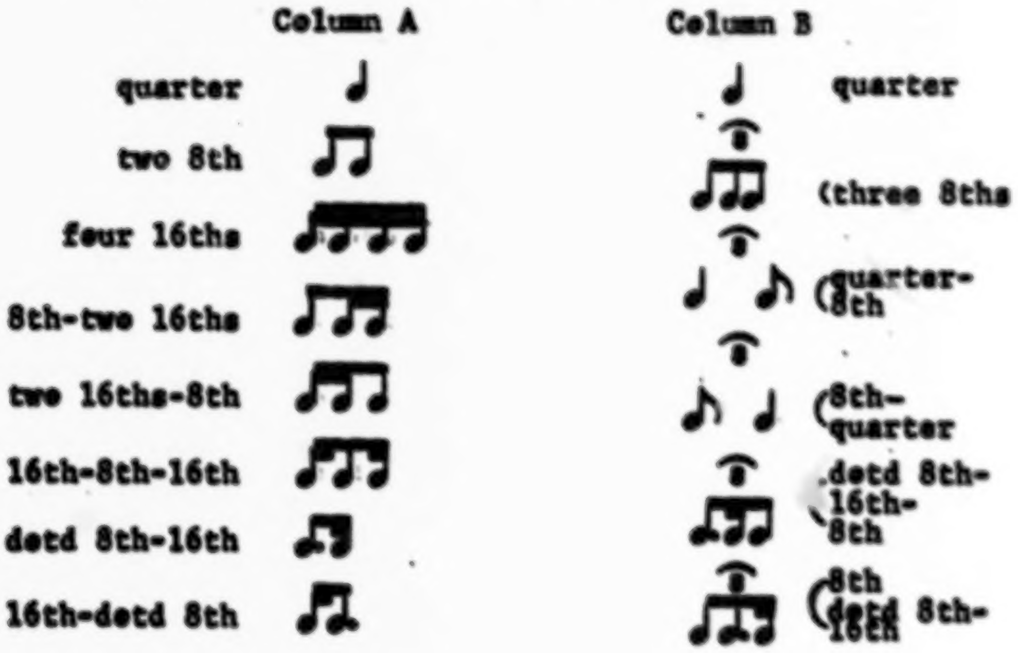
INSTRUCTION SHEET

Rhythm Test

Read before playing tape.

Instructions on the tape will give you most of the information necessary for taking this test. Write your answer in the upper box under the correct number of the example.

The following rhythms will be presented on this test:


Column A
Column B
quarter
two 8th
four 16ths
8th-two 16ths
two 16ths-8th
16th-8th-16th
dotd 8th-16th
16th-dotd 8th
quarter
(three 8ths
(quarter-8th
(8th-quarter
dotd 8th-16th-8th
(8th dotd 8th-16th

Now begin tape and follow these instructions.

On your paper you will see the written names of rhythms. You are to write the rhythm in music notation. You will be given time to look at each measure and then time to write your answer. Now look at the example on the sheet.

Example:	quarter; quarter; quarter;

You should have written three quarter notes.

NAME____________________ TITLE____________________

COURSE____________ INSTRUCTOR____________ DATE____________________

A 1	2	3	4	5	6	7	8
two 16ths-8th; 16th-8th-16th; quarter.	two 8ths; two 16ths-8th; quarter.	two 16ths-8th; 8th-two 16ths; quarter.	16th-dotd 8th; two 16ths-8th; quarter.	8th-two 16ths; two 8ths; quarter.	8th-two 16ths; 16th-dotd 8th; quarter.	16th-dotd 8th; dotd 8th-16th; quarter.	16th-8th-16th; 16th-dotd 8th; quarter.

B 1	2	3	4	5	6	7	8
dotd 8th-16th; two 8ths; quarter.	four 16ths; quarter; quarter.	16th-8th-16th; quarter; quarter.	8th-two 16ths; quarter; quarter.	dotd 8th-16th; 8th-two 16ths; quarter.	two 8ths; 16th-8th-16th; quarter.	two 16ths-8th; two 16ths-8th; quarter.	quarter 8th-two 16ths; quarter.

C 1	2	3	4	5	6	7	8
four 16ths; dotd 8th-16th; quarter.	four 16ths; 8th-two 16ths; quarter.	two 8ths; quarter; quarter.	quarter; two 8ths; quarter.	two 16ths-8th; two 8ths; quarter.	dotd 8th-16th; quarter; quarter.	dotd 8th-16th; 16th-8th-16th; quarter.	16th-dotd 8th; 16th-8th-16th; quarter.

D 1	2	3	4	5	6	7	8
two 8ths; two 8ths; quarter.	16th-dotd 8th; four 16ths; quarter.	16th-8th-16th; two 8ths; quarter.	16th-8th-16th; four 16ths; quarter.	16th-8th-16th; 16th-8th-16th; quarter.	two 16ths-8th; 16th-dotd 8th; quarter.	quarter; dotd 8th-16th; quarter.	four 16ths; 16th-8th-16th; quarter.

NAME____________________ TITLE____________________

COURSE________________ INSTRUCTOR________________ DATE________________

A

1	2	3	4	5	6	7	8
four 16ths; four 16ths; quarter.	dotd 8th-16th; four 16ths; quarter.	two 16ths-8th; dotd 8th-16th; quarter.	two 8ths; 16th-dotd 8th; quarter.	8th-two 16ths; two 16ths-8th; quarter.	two 16ths-8th; four 16ths; quarter.	four 16ths; two 8ths; quarter.	16th-8th-16th; dotd 8th-16th; quarter.

B

1	2	3	4	5	6	7	8
four 16ths; two 16ths-8th; quarter.	two 8ths; four 16ths; quarter.	two 8ths; dotd 8th-16th; quarter.	quarter; 16th-8th-16th; quarter.	16th-dotd 8th; two 8ths; quarter.	two 8ths; 8th-two 16ths; quarter.	8th-two 16ths; 8th-two 16ths; quarter.	16th-8th-16th; two 16ths-8th; quarter.

C

1	2	3	4	5	6	7	8
16th-dotd 8th; 16th-dotd 8th; quarter.	quarter; 16th-dotd 8th; quarter.	two 16ths-8th; quarter; quarter.	dotd 8th-16th; 16th-dotd 8th; quarter.	8th-two 16ths; 16th-8th-16th; quarter.	8th-two 16ths; four 16ths; quarter.	quarter; quarter; quarter.	dotd 8th-16th; dotd 8th-16th; quarter.

D

1	2	3	4	5	6	7	8
16th-dotd 8th; quarter; quarter.	quarter; two 16ths-8th; quarter.	quarter; four 16ths; quarter.	dotd 8th-16th; two 16ths-8th; quarter.	16th-dotd 8th; 8th-two 16ths; quarter.	four 16ths; 16th-dotd 8th; quarter.	8th-two 16ths; dotd 8th-16th; quarter.	16th-8th-16th; 8th-two 16ths; quarter.

NAME________________________________ TITLE____________________

COURSE__________ INSTRUCTOR__________________ DATE____________________

A

1	2	3	4	5	6	7	8
(8th- quarter; (8th- quarter; quarter.	quarter; (8th- quarter; quarter.	(8th- dotd 8th- 16th; (three 8ths; quarter.	(8th- quarter; (8th- dotd 8th- 16th; quarter.	(three 8ths; (8th- dotd 8th- 16th; quarter.	(dotd 8th- 16th-8th; quarter; quarter.	(dotd 8th- 16th-8th; (dotd 8th- 16th-8th; quarter.	(dotd 8th- 16th-8th; (8th- quarter; quarter.

B

1	2	3	4	5	6	7	8
quarter; (dotd 8th- 16th-8th; quarter.	(quarter- 8th; (8th-dotd 8th- 16th; quarter.	(quarter- 8th; (8th- quarter; quarter.	(8th- dotd 8th- 16th; (8th- dotd 8th- 16th; quarter.	quarter; (quarter- 8th; quarter.	(8th- dotd 8th- 16th; (dotd 8th- 16th-8th; quarter.	(quarter- 8th; quarter; quarter.	(quarter- 8th; (dotd 8th- 16th-8th; quarter.

C

1	2	3	4	5	6	7	8
(8th- quarter; (quarter- 8th; quarter.	(8th- dotd 8th- 16th; (quarter- 8th; quarter.	(8th- quarter; (three 8ths; quarter.	(dotd 8th- 16th-8th; (8th- dotd 8th- 16th; quarter.	quarter; (8th- dotd 8th- 16th; quarter.	(8th- dotd 8th- 16th; quarter; quarter.	(three 8ths; (quarter- 8th; quarter.	(dotd 8th- 16th- 8th; (quarter- 8th; quarter.

NAME________________________ TITLE________________

COURSE____________ INSTRUCTOR____________ DATE________________

D

1	2	3	4	5	6	7	8
(quarter- 8th; (three 8ths; quarter.	(three 8ths; (dotd 8th- 16th- 8th; quarter.	(dotd 8th- 16th-8th; (three 8ths; quarter.	(three 8ths; (8th- quarter; quarter.	quarter; (three 8ths; quarter.	(8th- quarter; 8th- dotd 8th- 16th; quarter.	(three 8ths; quarter; quarter.	(8th- dotd 8th- 16th; (8th- quarter; quarter.

E

1	2	3	4
quarter; quarter; quarter.	(quarter- 8th; (quarter- 8th; quarter.	(three 8ths; (three 8ths; quarter.	(8th- quarter; quarter; quarter.

INSTRUCTION SHEET

Rhythm Test

Modes 2 and 3.

Begin tape and follow these instructions.

In this part of the test you are asked to look at rhythms in notation and sing these rhythms with the syllable "ta". Each sound of the metronome represents one quarter note. Here is an example of the procedure:

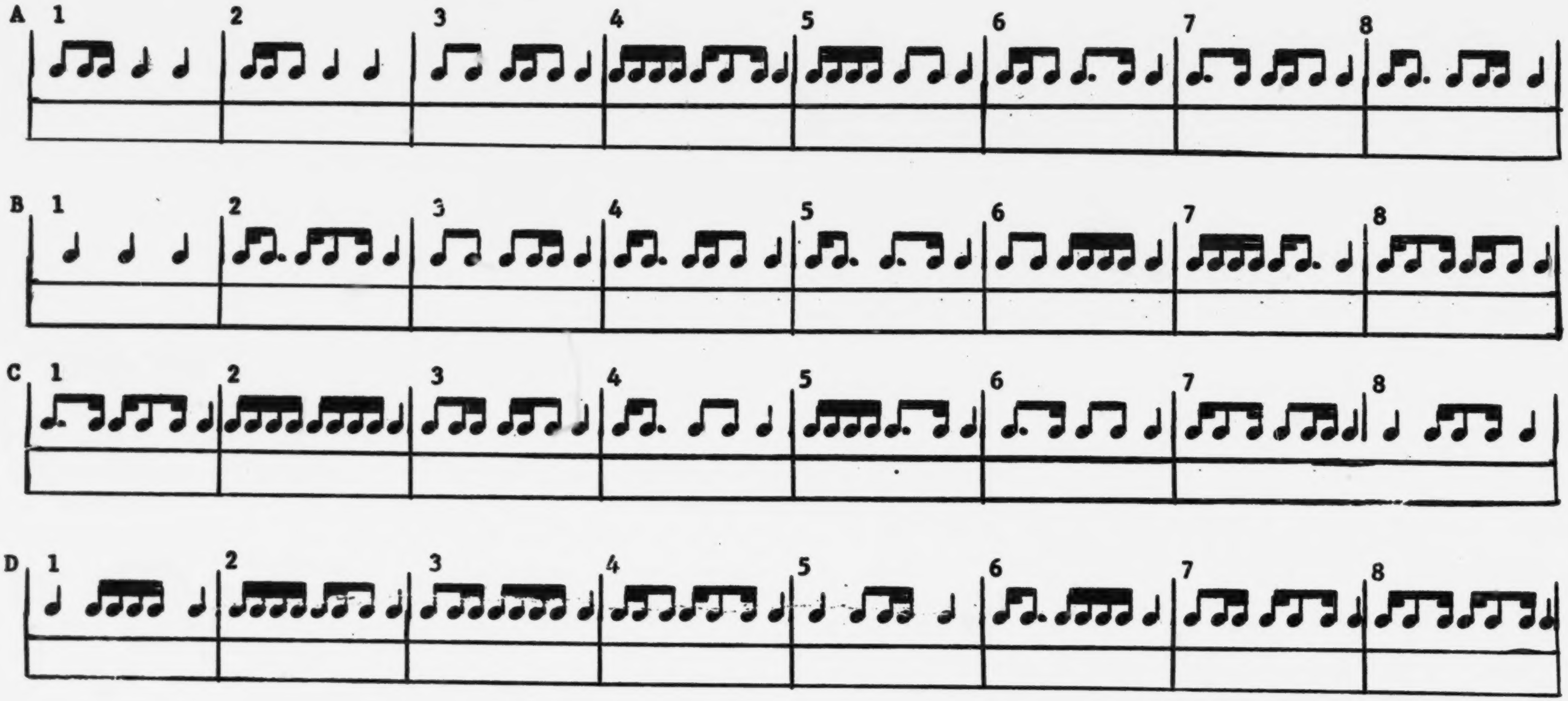
EXAMPLE

Now sing.

You should have sung three (3) quarter notes.

NAME____________________________________ TITLE__________________

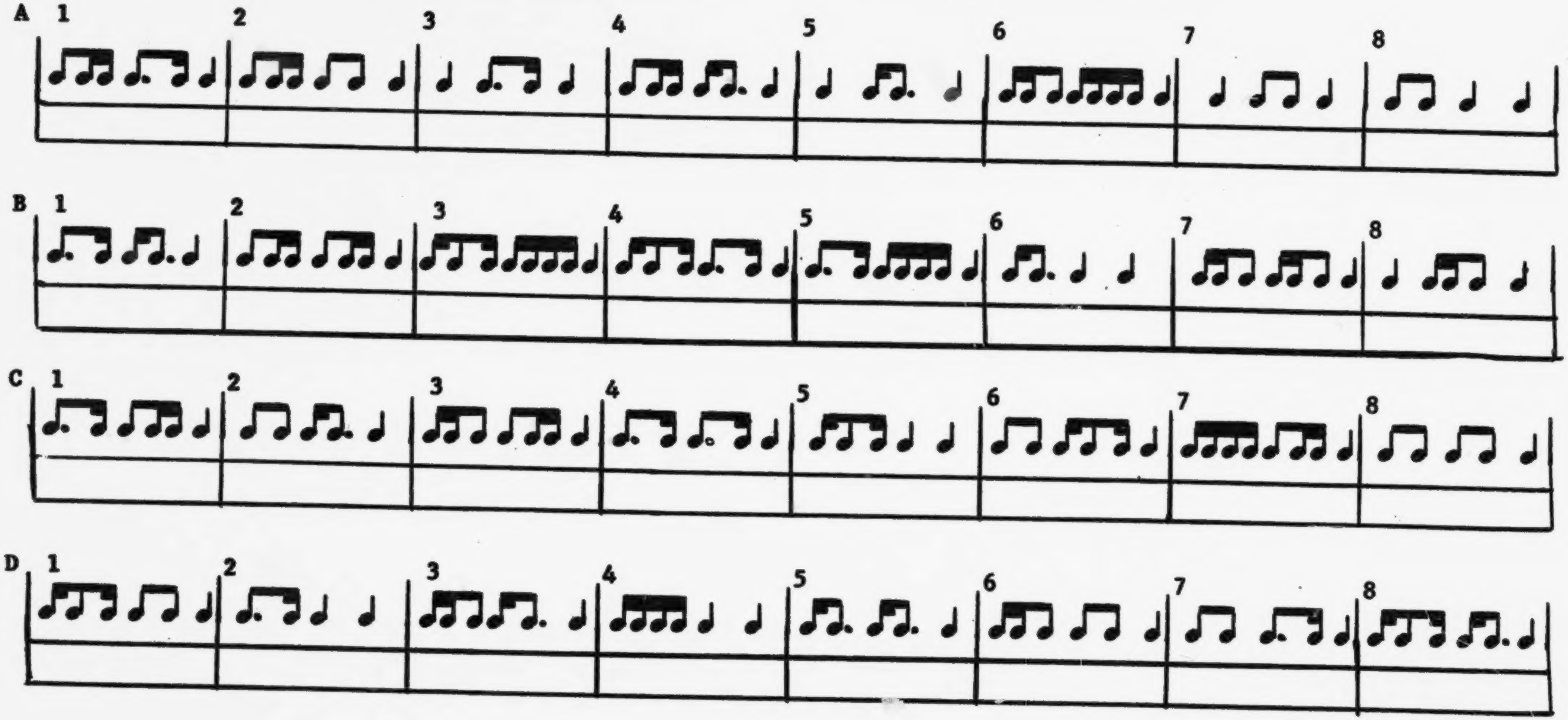
COURSE____________ INSTRUCTOR__________________ DATE__________________


A
1
2
3
4
5
6
7
8
B
1
2
3
4
5
6
7
8
C
1
2
3
4
5
6
7
8
D
1
2
3
4
5
6
7
8

A$_1$

NAME__________________________________ TITLE____________________

COURSE______________ INSTRUCTOR________________ DATE____________________


A
1
2
3
4
5
6
7
8
B
1
2
3
4
5
6
7
8
C
1
2
3
4
5
6
7
8
D
1
2
3
4
5
6
7
8

A2

Mode 3

Begin tape and follow these instructions.

In this part of the test you are asked to listen to rhythms played on the piano and to sing these rhythms with the syllable "ta". Each sound of the metronome represents one quarter note. Here is an example of the procedure:

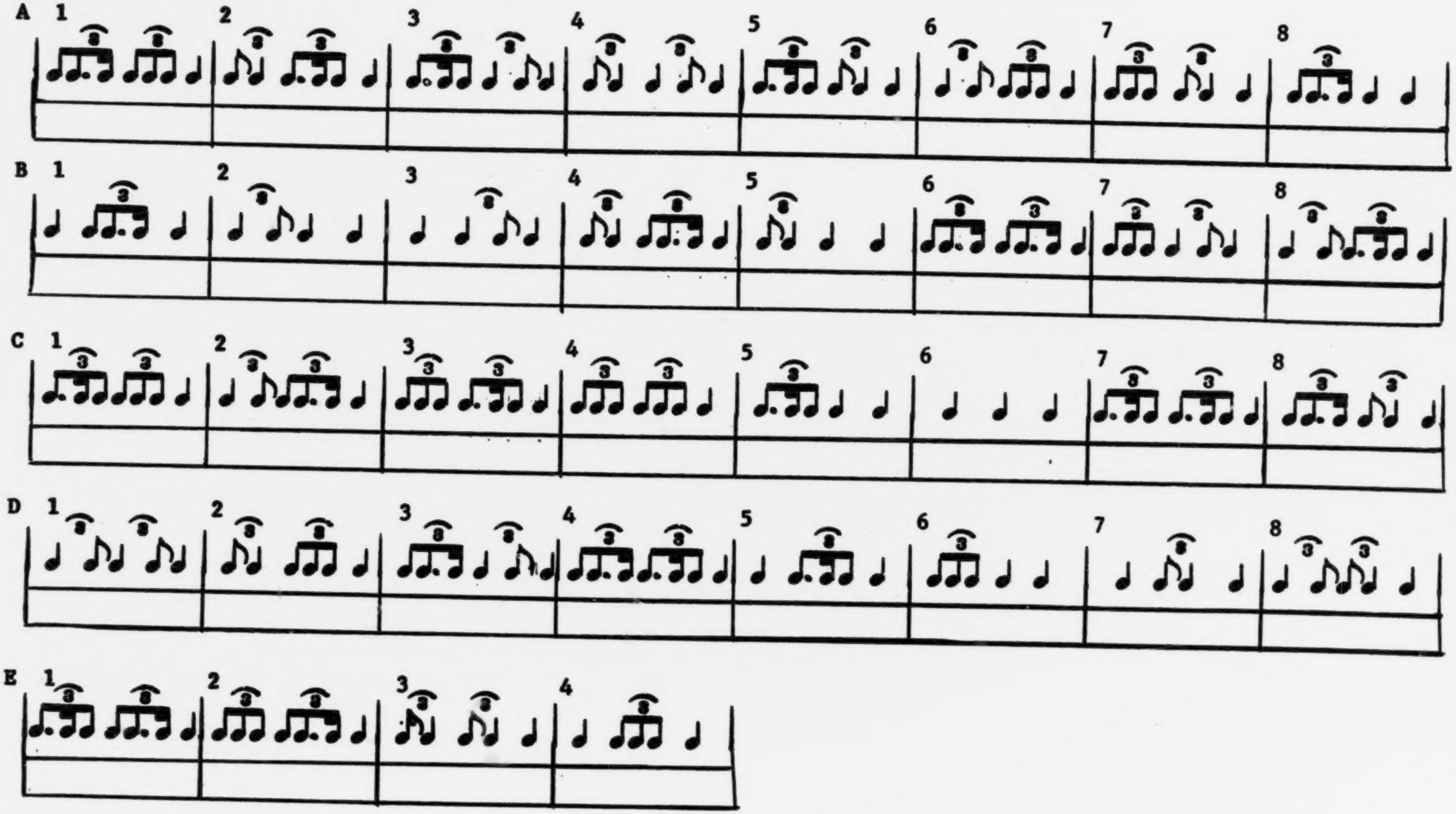
EXAMPLE

Now sing.

You should have sung "ta, ta, ta".

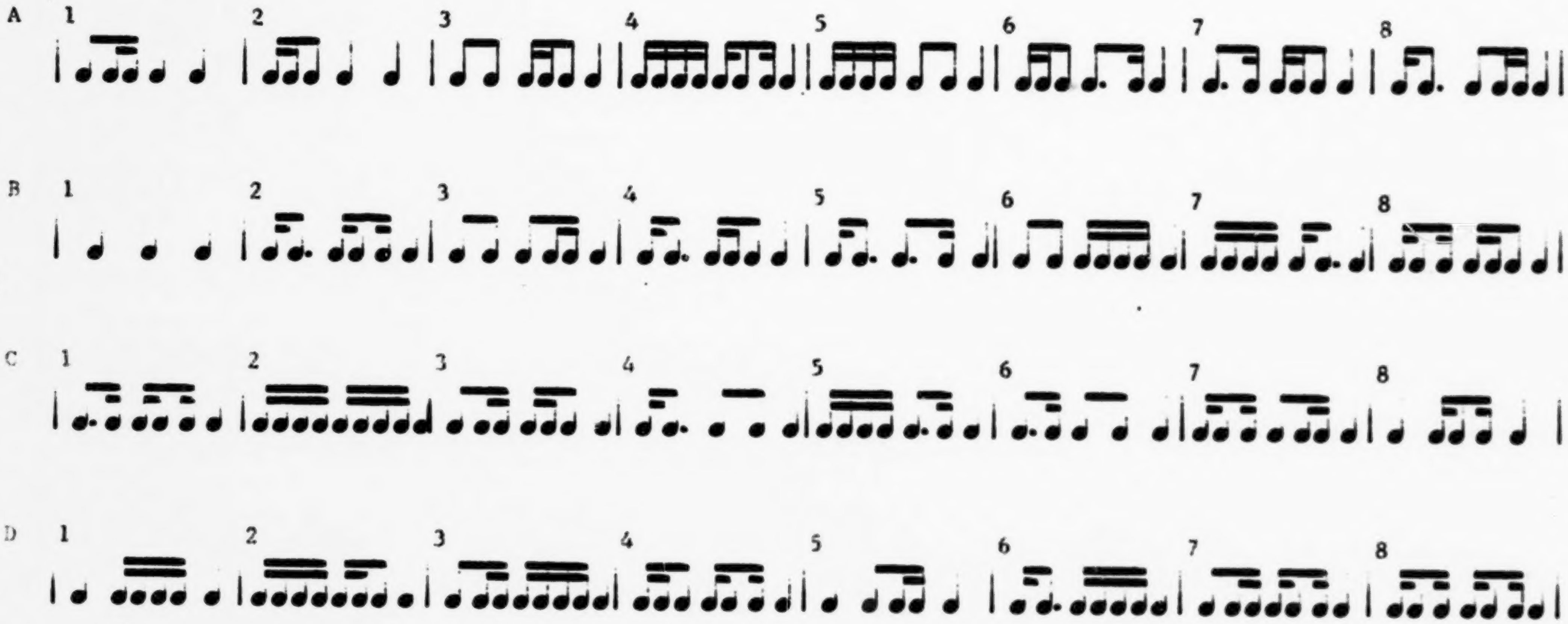
NAME______________________________ TITLE____________________

COURSE______________ INSTRUCTOR________________ DATE____________________

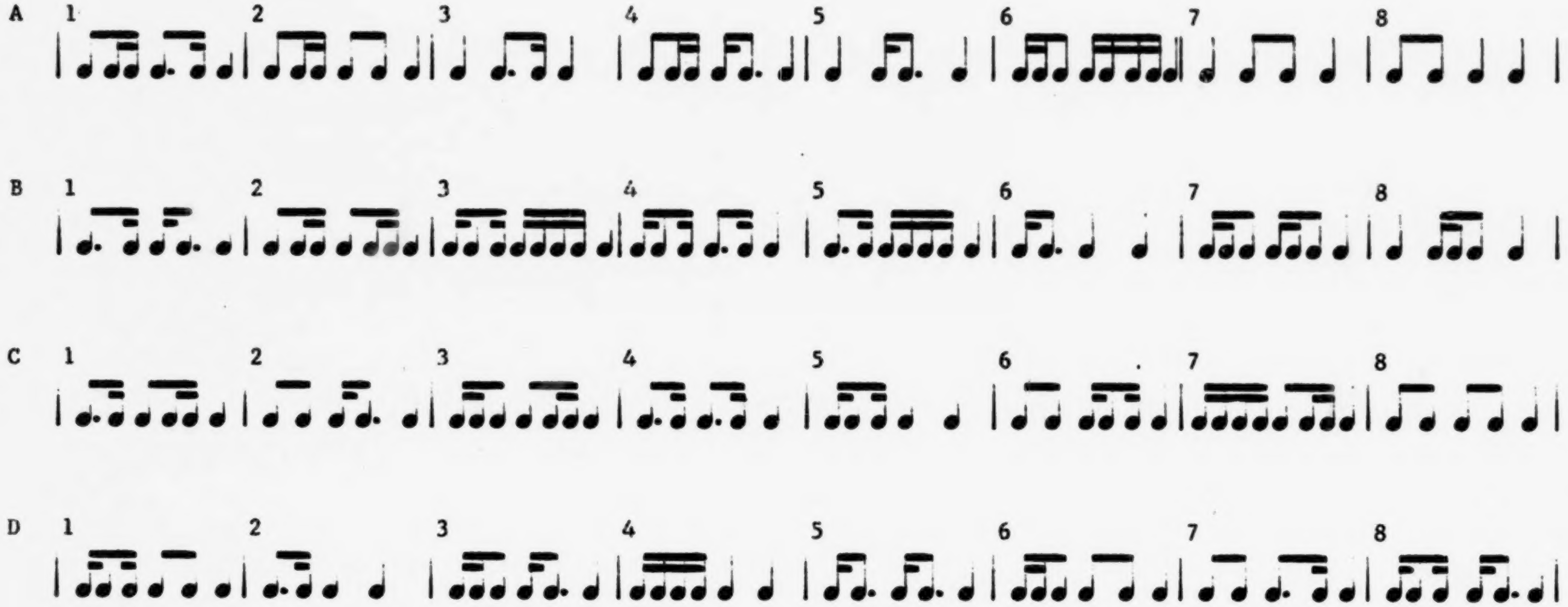

A
1
2
3
4
5
6
7
8
B
1
2
3
4
5
6
7
8
C
1
2
3
4
5
6
7
8
D
1
2
3
4
5
6
7
8
E
1
2
3
4
3

B

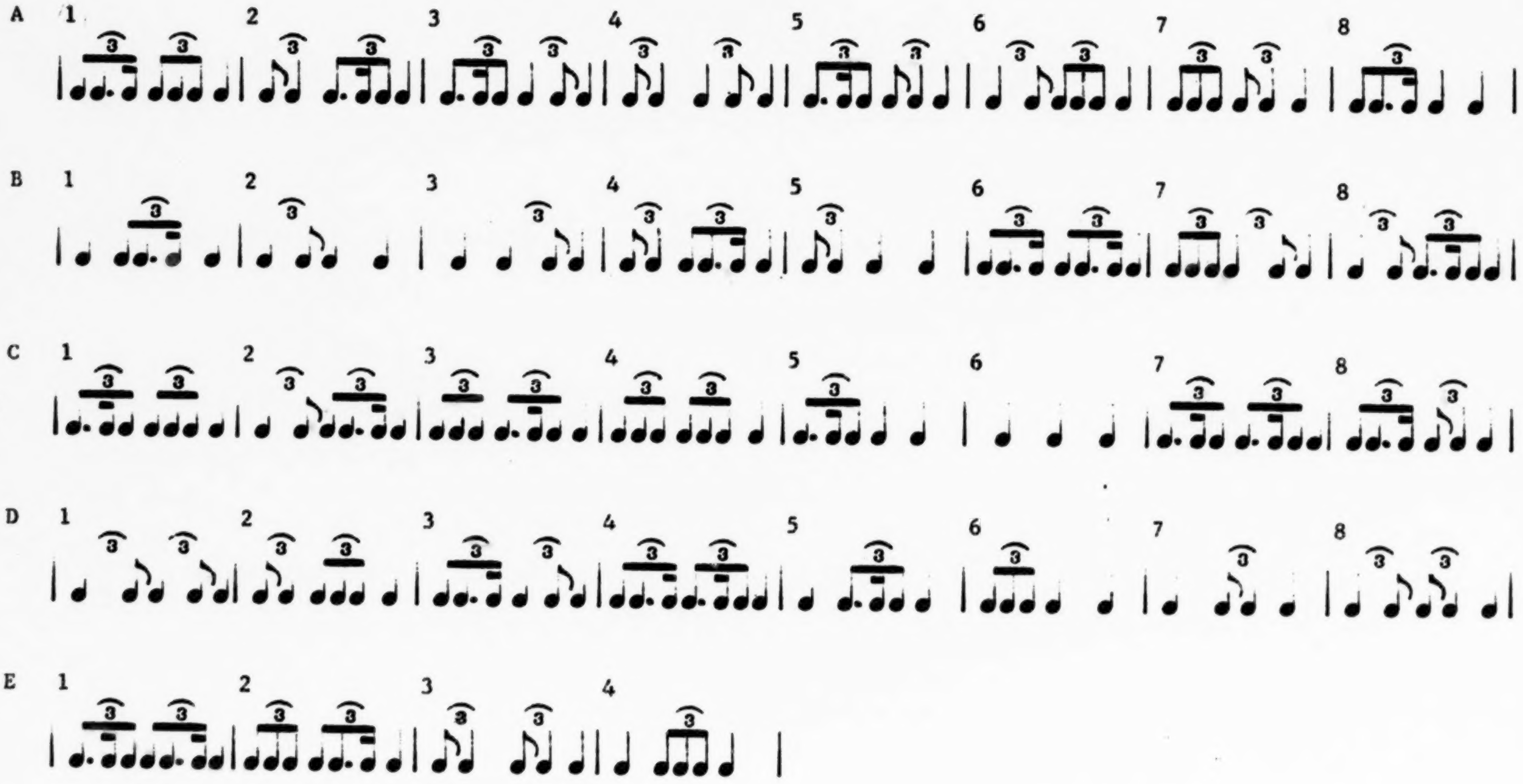
Rhythm Test 2 Section A1


A
1
2
3
4
5
6
7
8
B
1
2
3
4
5
6
7
8
C
1
2
3
4
5
6
7
8
D
1
2
3
4
5
6
7
8

Rhythm Test 2 Section A$_2$


A
1
2
3
4
5
6
7
8
B
1
2
3
4
5
6
7
8
C
1
2
3
4
5
6
7
8
D
1
2
3
4
5
6
7
8

Rhythm Test 2 Section B

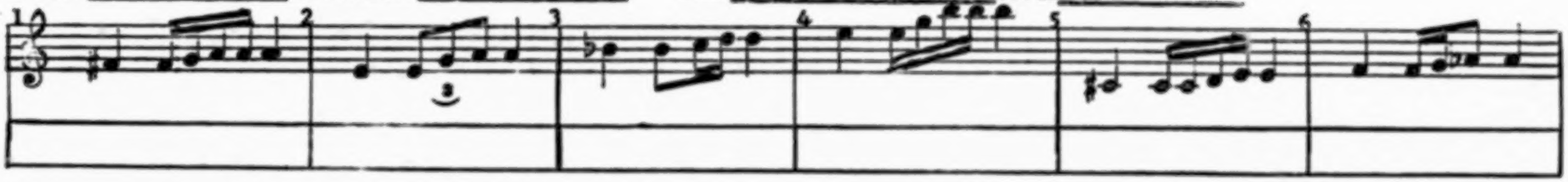

A
1
2
3
4
5
6
7
8
B
1
2
3
4
5
6
7
8
C
1
2
3
4
5
6
7
8
D
1
2
3
4
5
6
7
8
E
1
2
3
4
3

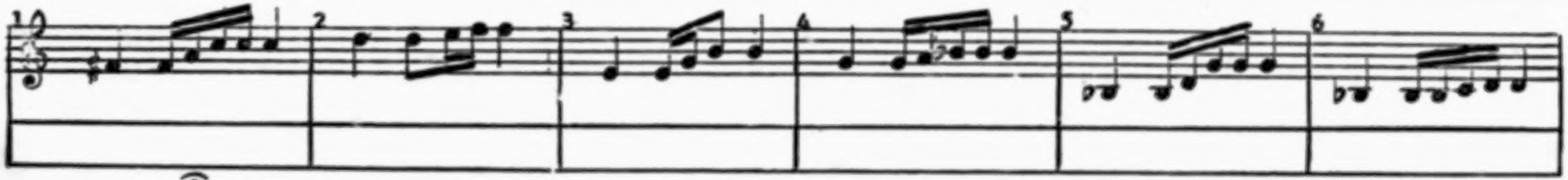
APPENDIX E

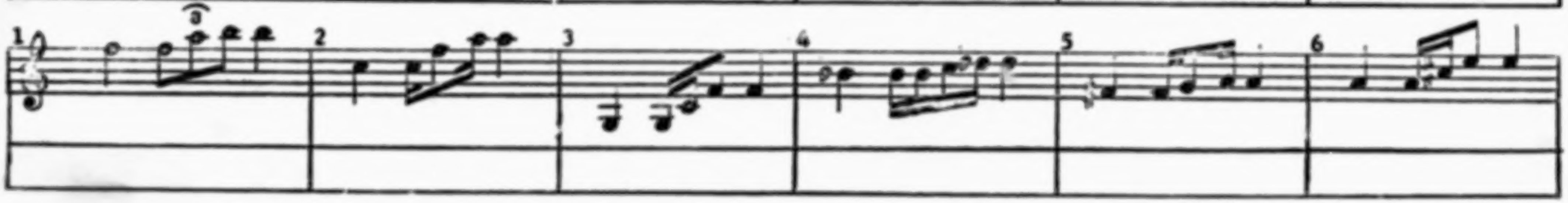
TONE GROUP INSTRUCTIONAL MATERIAL

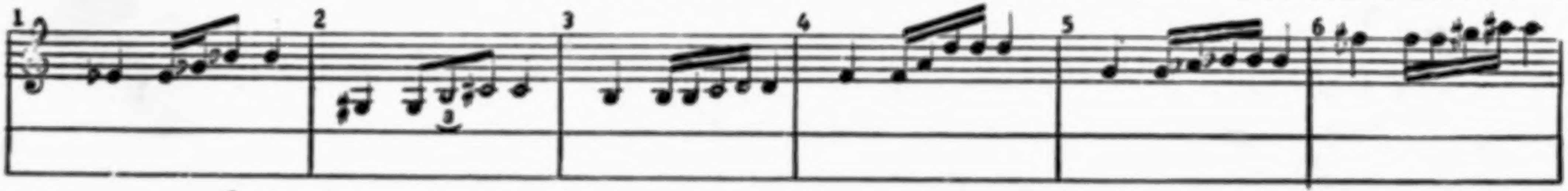
NAME____________________ TITLE 10 TGA$_2$ NO.__________

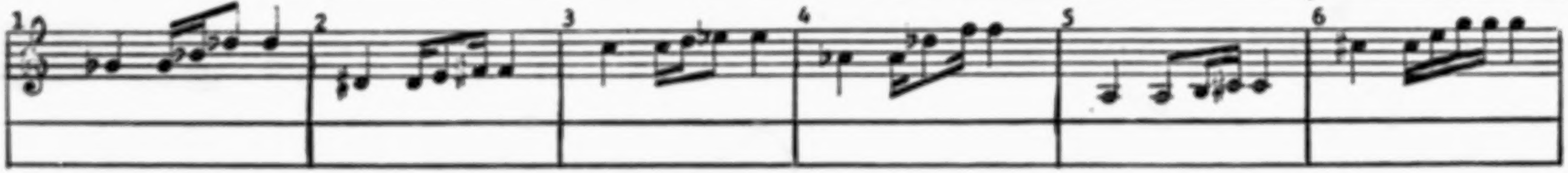
COURSE__________ INSTRUCTOR__________ DATE__________ BOOTH__________

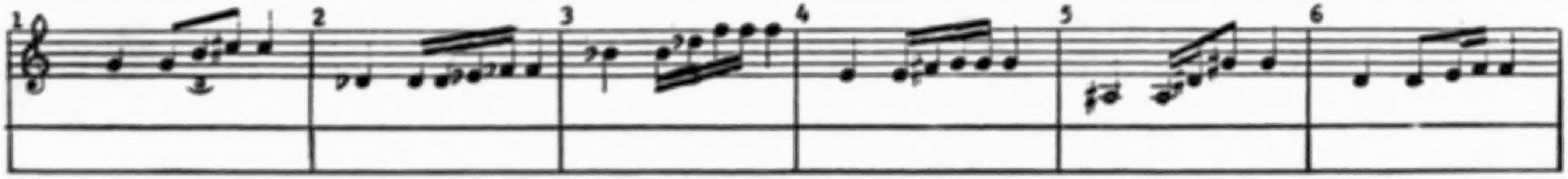
A


B


C


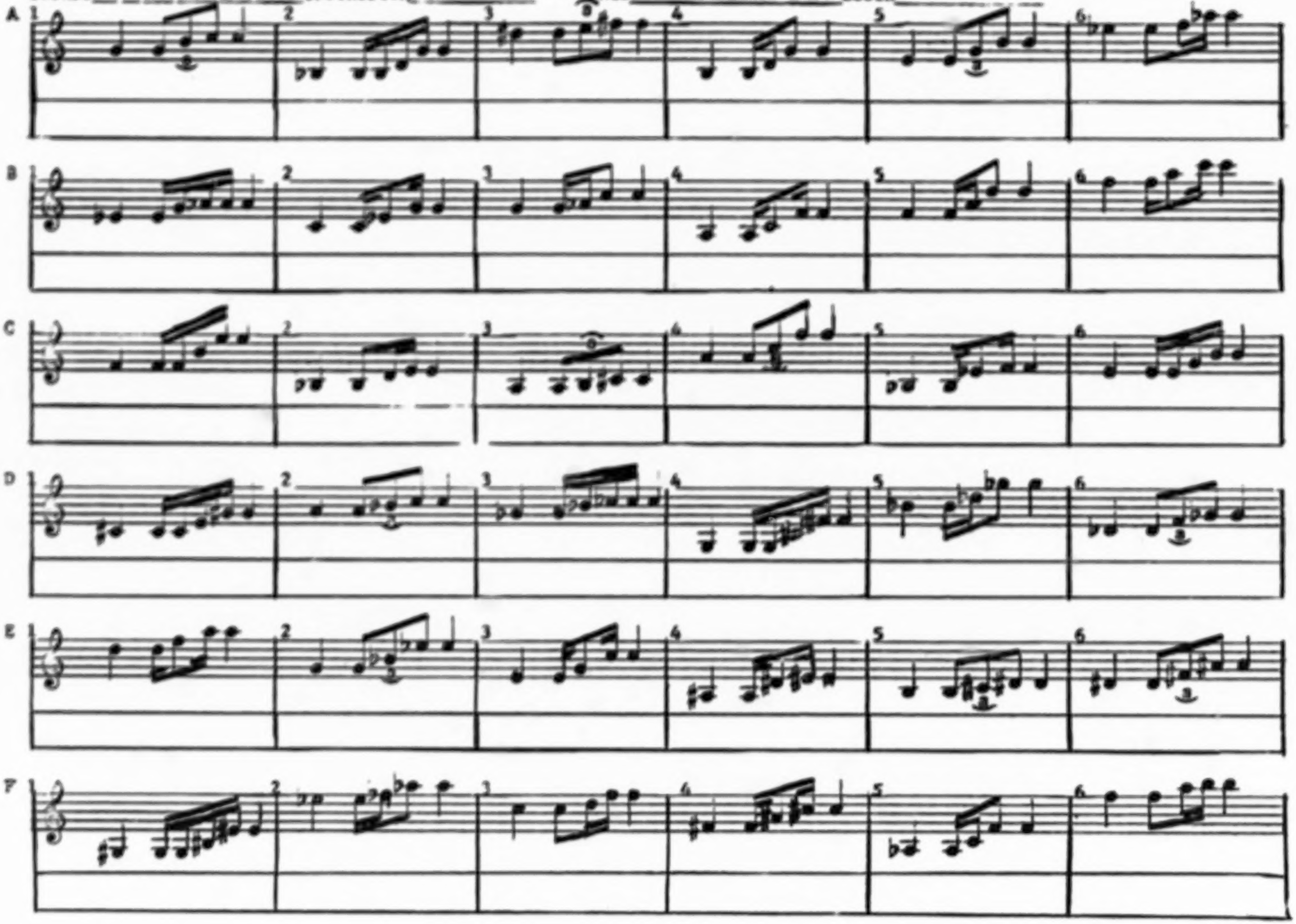
D


E


F


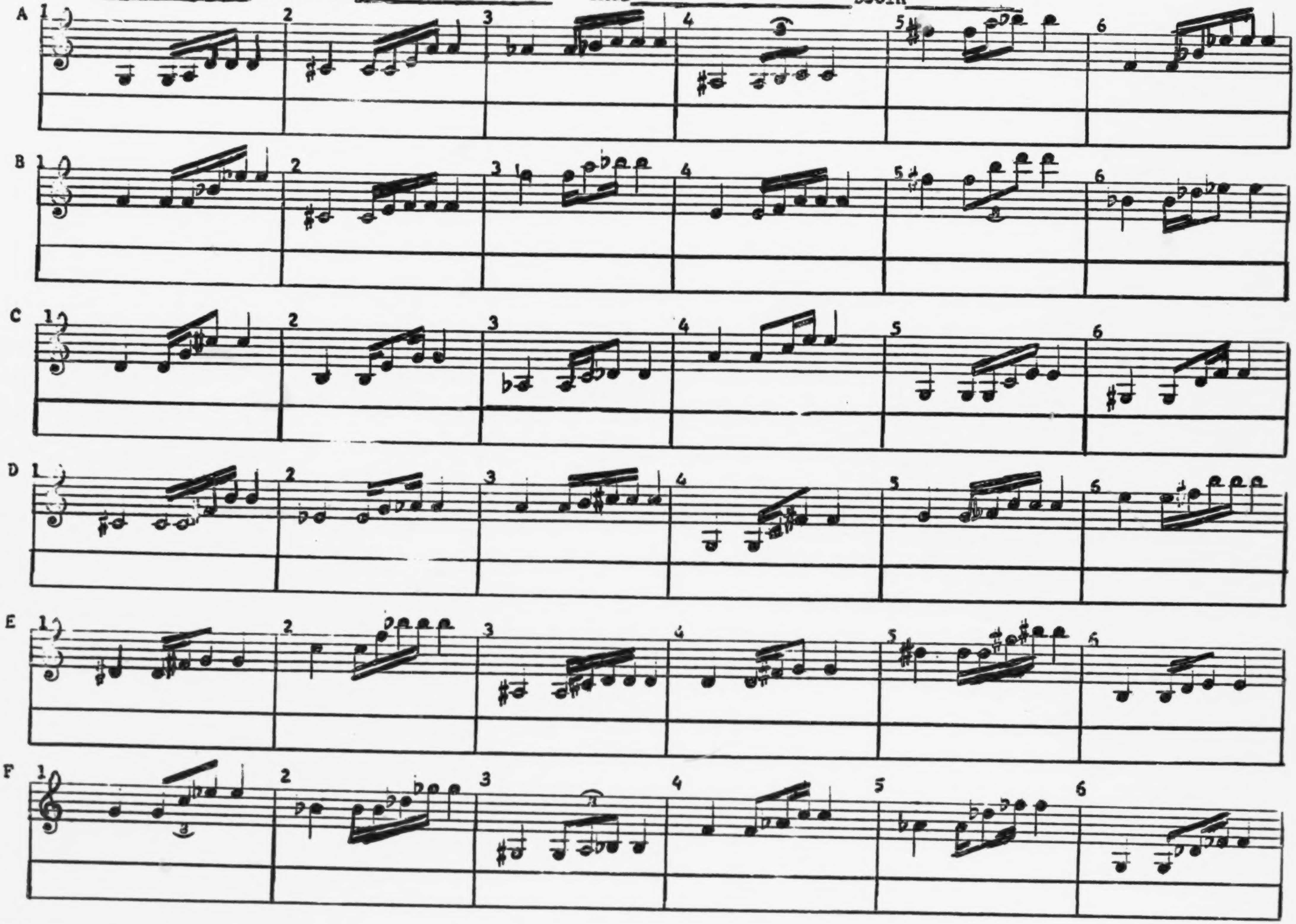
NAME________________________ TITLE____20 TDA2________ NO.____________

COURSE________________ INSTRUCTOR__________ DATE____________________ BOOTH____________


A
B
C
D
E
F
1
2
3
4
5
6

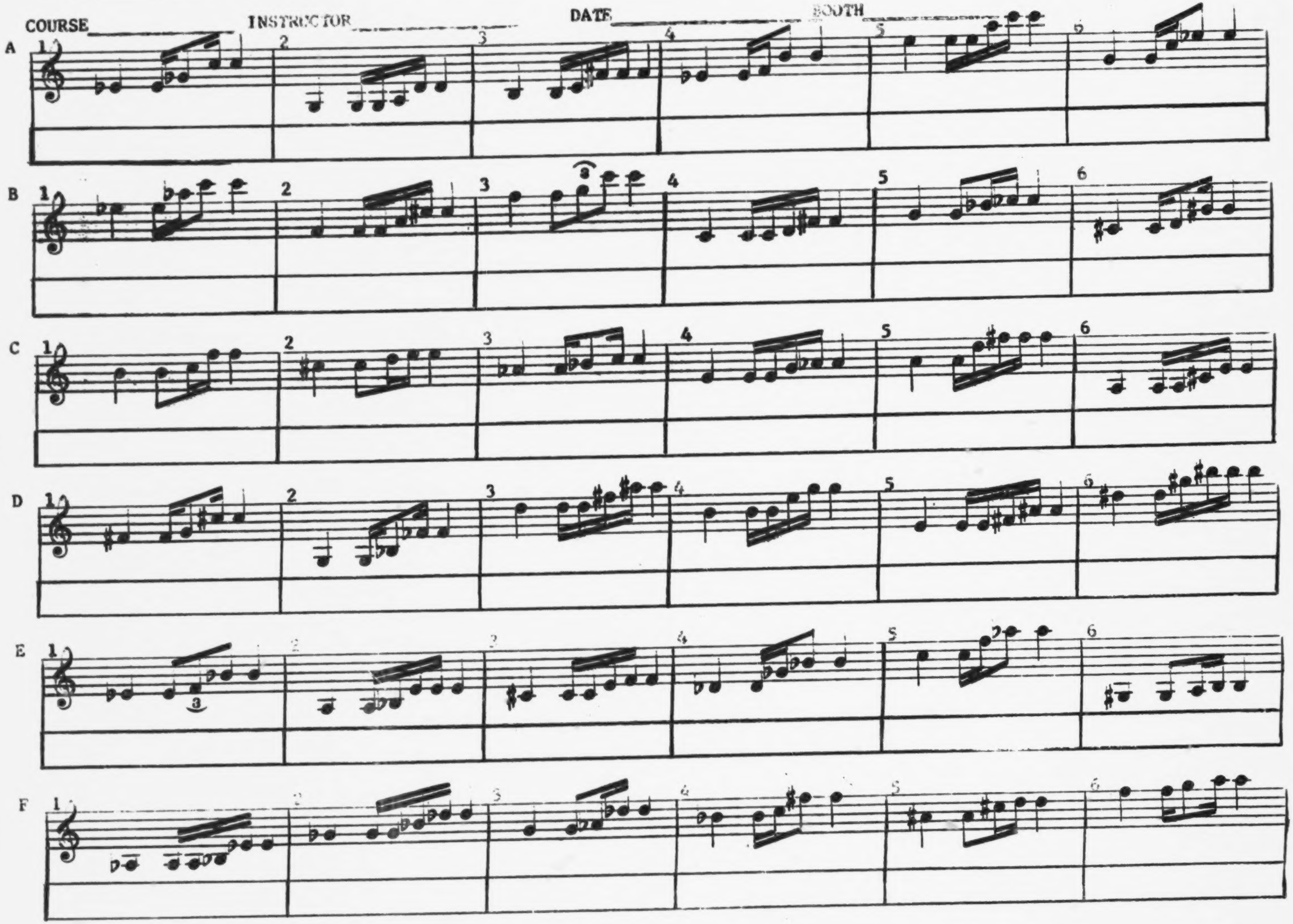
NAME____________________ TITLE 30 TGA2 NO.__________

COURSE__________ INSTRUCTOR__________ DATE__________ BOOTH__________


A
B
C
D
E
F
1
2
3
4
5
6

NAME ______________________ TITLE 40 TGA ______ NO. ______

COURSE __________ INSTRUCTOR __________ DATE __________ BOOTH __________


A
B
C
D
E
F
1
2
3
4
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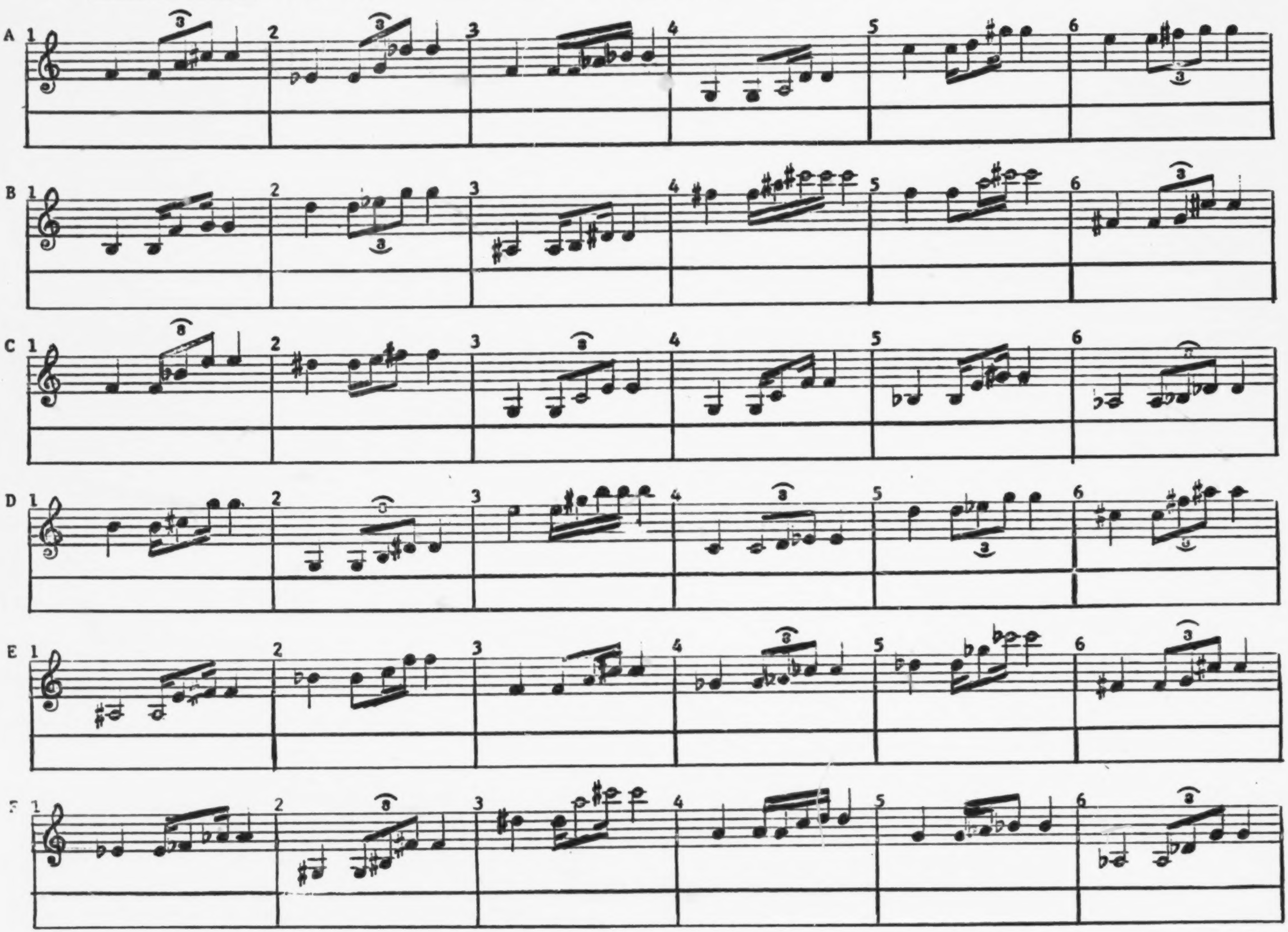
6
3

NAME________________ TITLE 50 TGA$_2$ NO.________

COURSE________ INSTRUCTOR________ DATE________ BOOTH________


A
B
C
D
E
F
1
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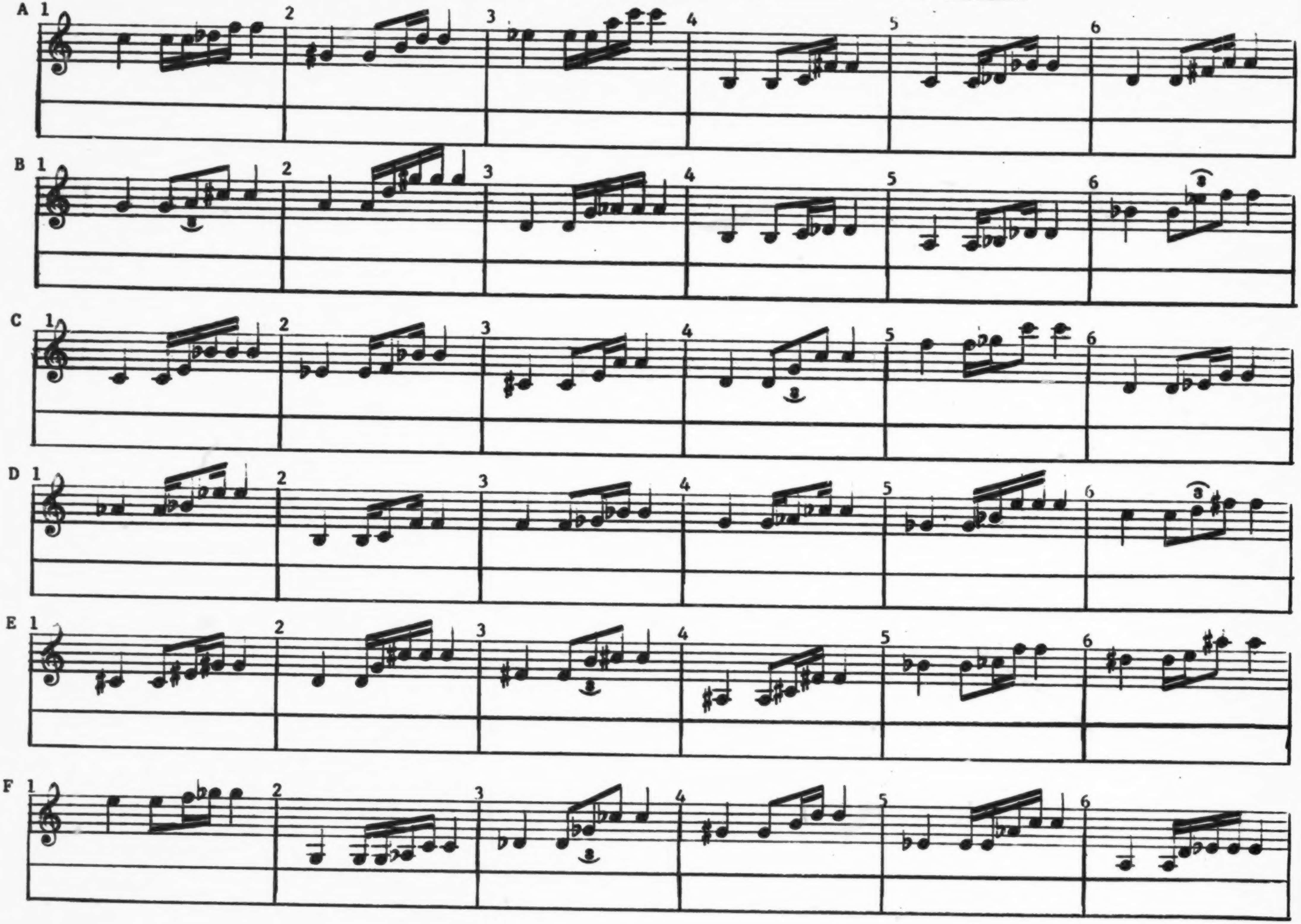
6
3

NAME________________________ TITLE 60TCA 2 ________ NO ________

COURSE__________ INSTRUCTOR______________ DATE______________ BOOTH________


A
B
C
D
E
F
1
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3
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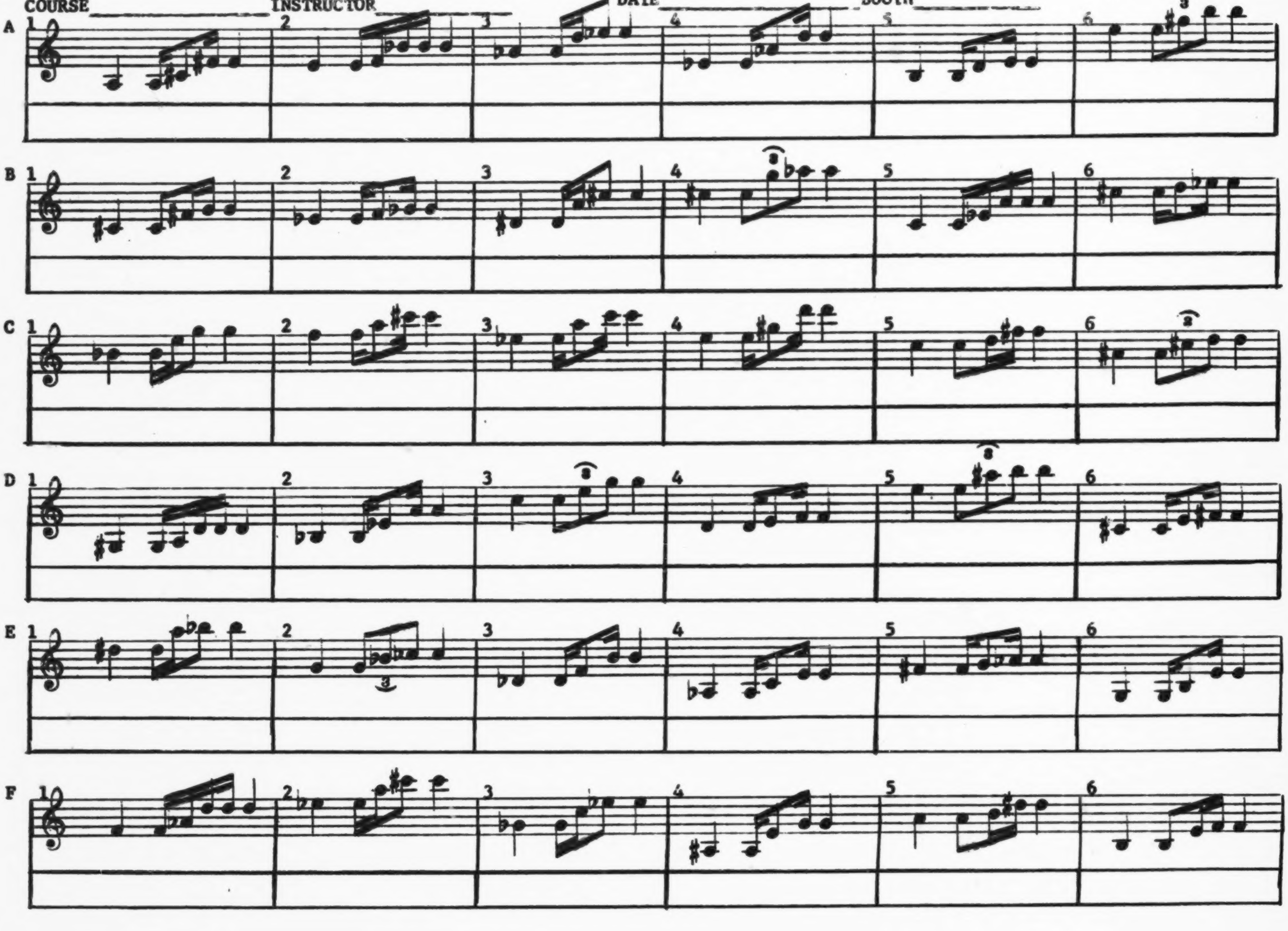
5
6
3

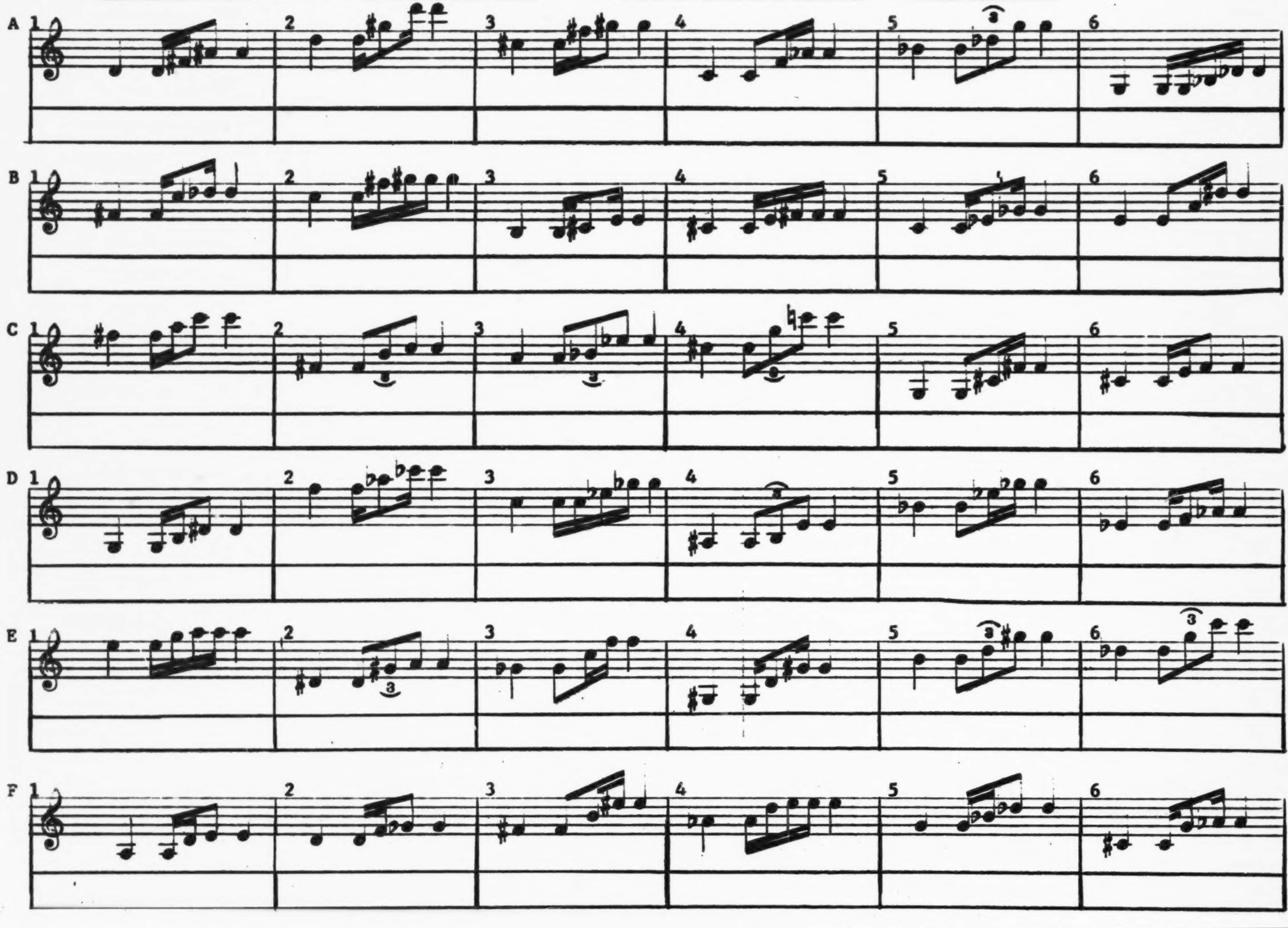
NAME______________________ TITLE 70 TCA2 NO.__________

COURSE____________ INSTRUCTOR____________ DATE____________ BOOTH__________


A
B
C
D
E
F
1
2
3
4
5
6
3

NAME________________ TITLE 80 TGA2 ________ NO.________

COURSE________ INSTRUCTOR________ DATE________ BOOTH________


A
B
C
D
E
F
1
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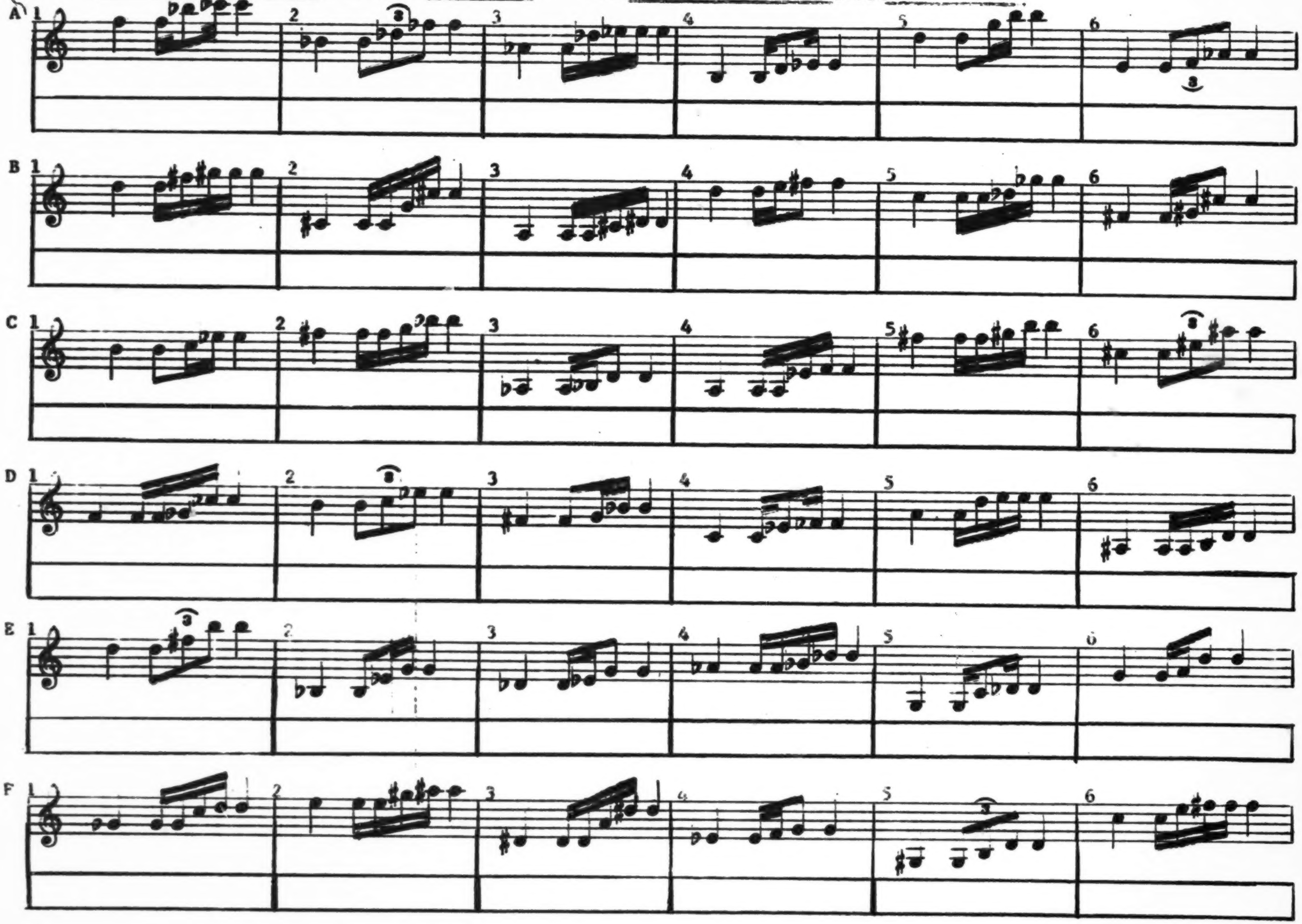
4
5
6
3

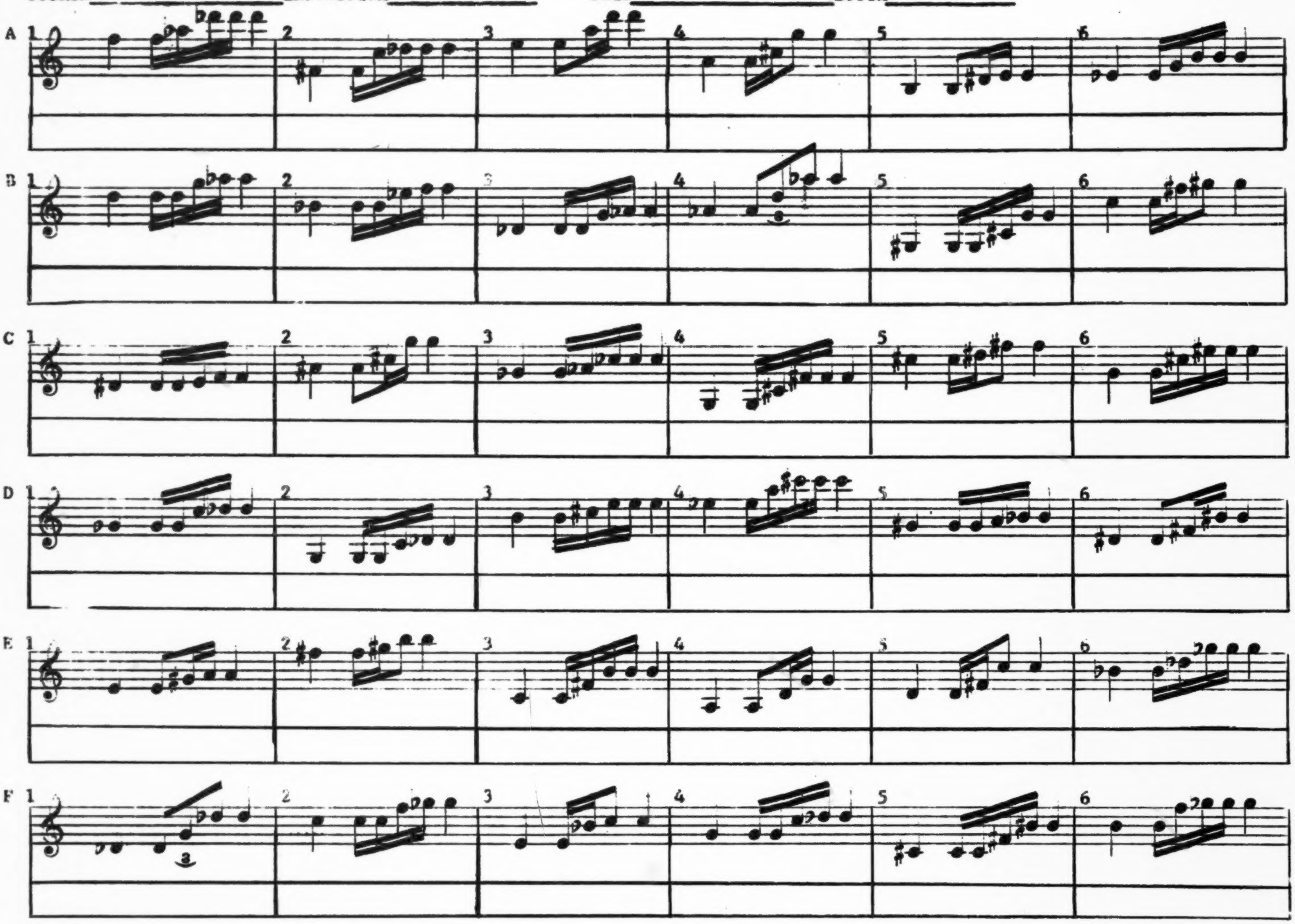
NAME________________ TITLE 90 TCA2 NO.________

COURSE________ INSTRUCTOR________ DATE________ BOOTH________


A
B
C
D
E
F
1
2
3
4
5
6

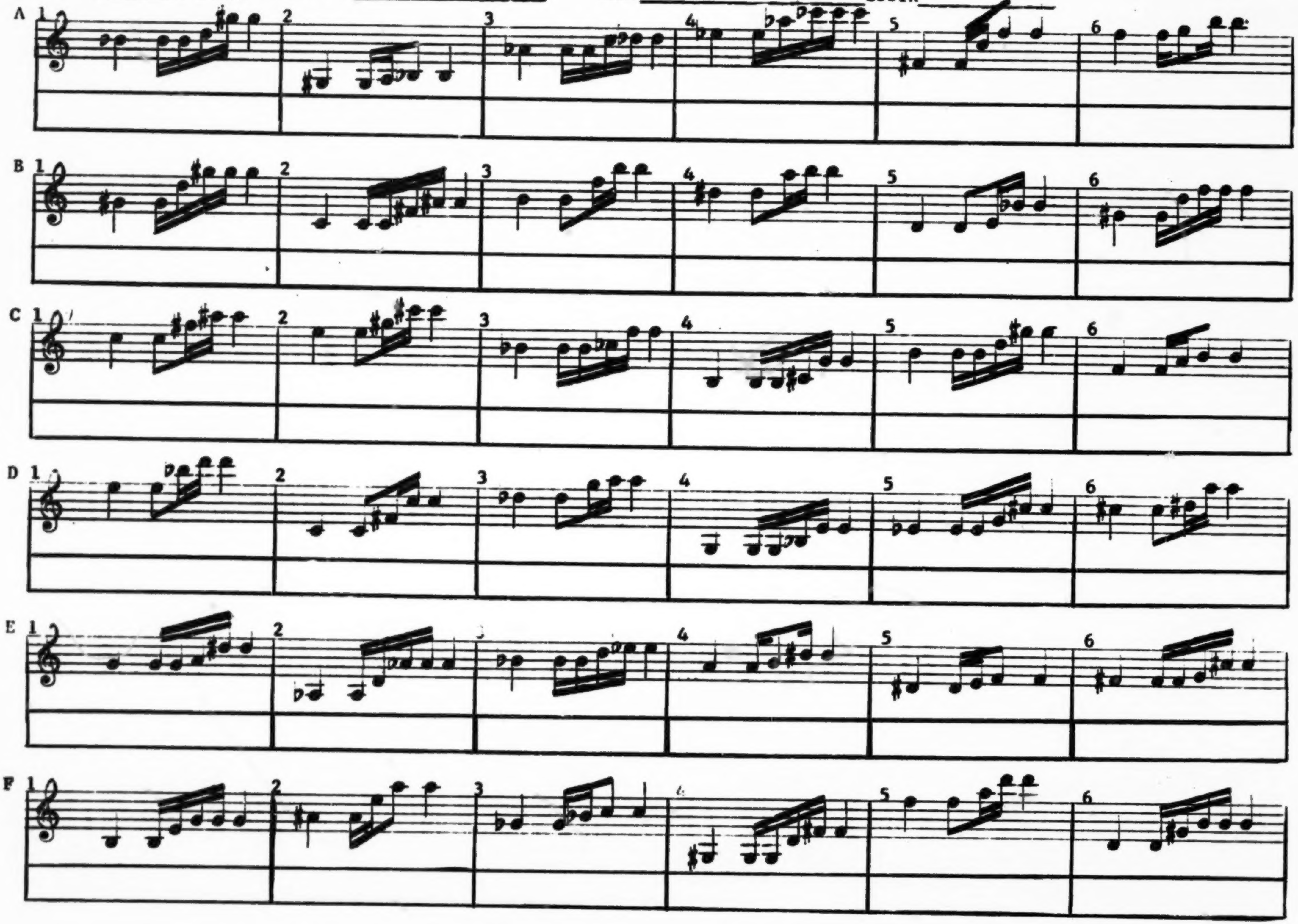
NAME________________ TITLE 100 TGA$_2$ ________ NO.________

COURSE________ INSTRUCTOR________ DATE________ BOOTH________


A
B
C
D
E
F
1
2
3
4
5
6
3

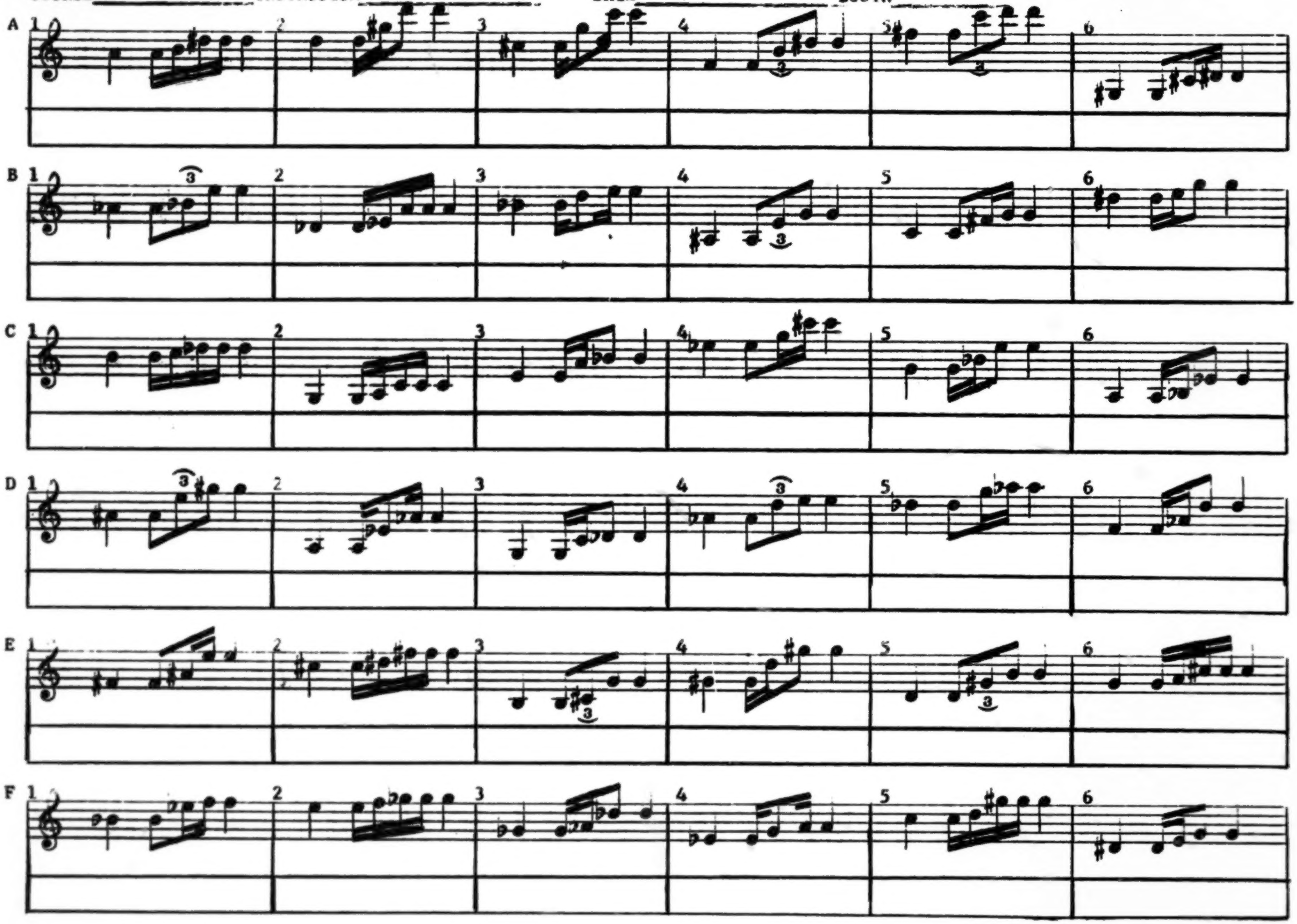
NAME______________________ TITLE 110 TGA2________ NO.__________

COURSE__________ INSTRUCTOR______________ DATE______________ BOOTH__________


A
B
C
D
E
F
1
2
3
4
5
6

NAME____________________ TITLE 120 TGA2 ______ NO.________

COURSE__________ INSTRUCTOR__________ DATE__________ BOOTH__________


A
B
C
D
E
F
1
2
3
4
5
6
3

APPENDIX F

TONE GROUP TESTS

Tape I

TONE GROUP TEST

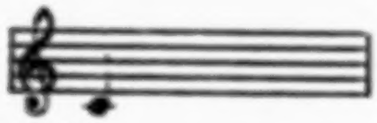
Mode I

This is the first part of a test in which you are to identify tone groups in four different ways. There are two parts on this tape.

In the first part you will see the first note on the printed page; you will hear the tone group played on the piano and you will be asked to write in notation on the staff the remaining notes of this group.

Here is an example:

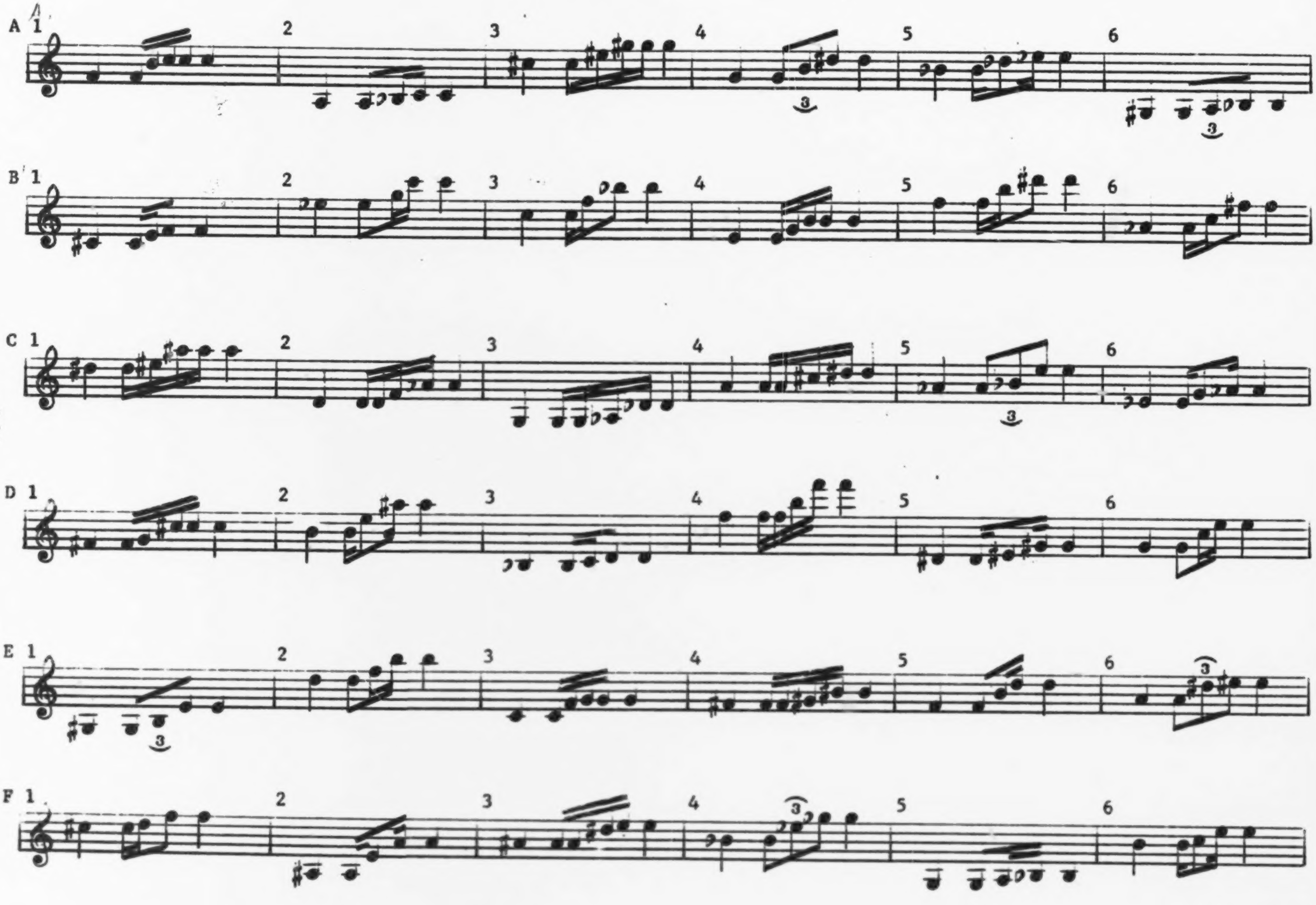
(Write the tone group on this staff)



You should have written the following:

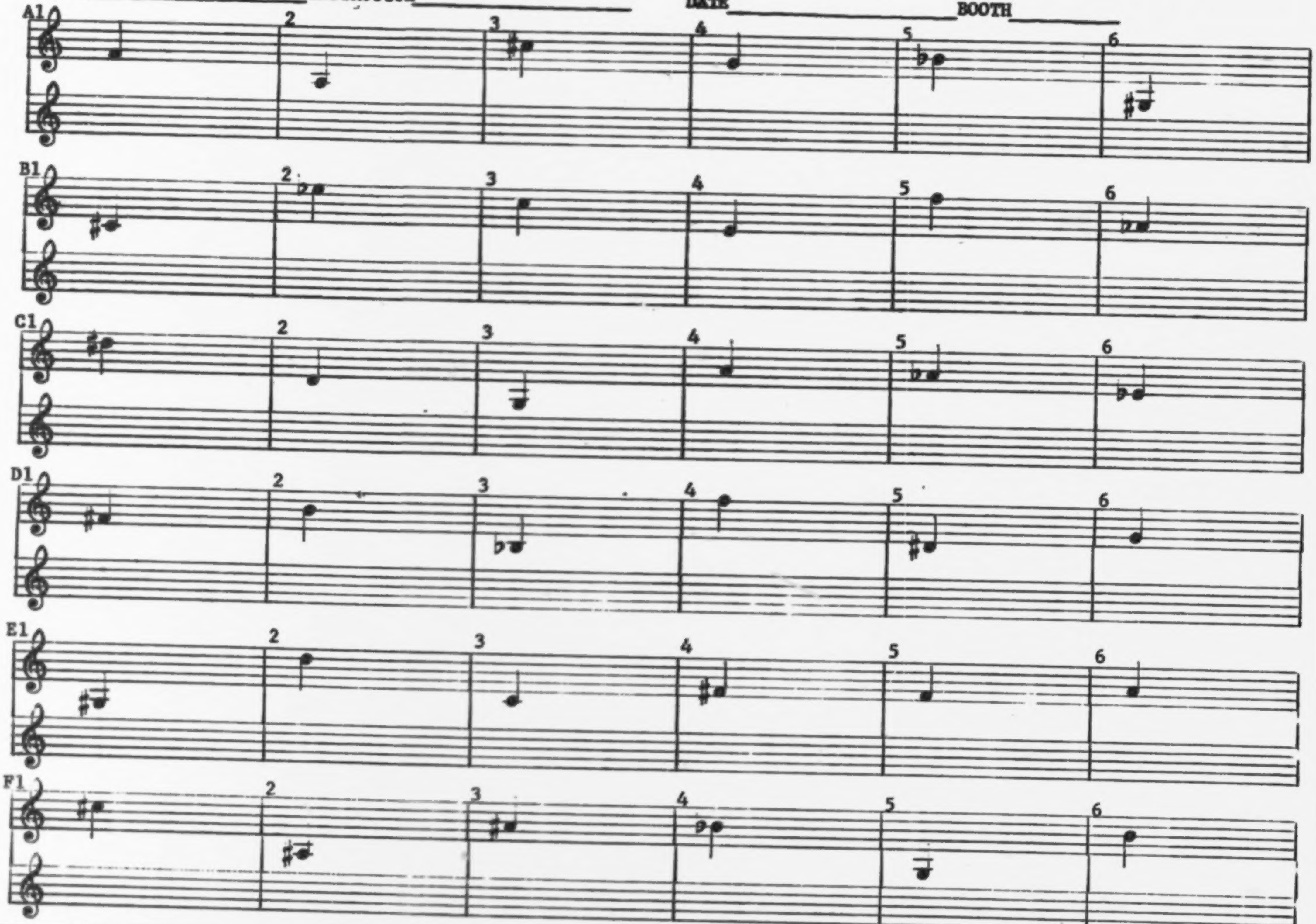
triplet "c - d - e," quarter "e".

Tone Group Test TGA$_1$


A 1
2
3
4
5
6
3
3
B 1
2
3
4
5
6
C 1
2
3
4
5
6
3
D 1
2
3
4
5
6
E 1
2
3
4
5
6
3
3
F 1
2
3
4
5
6
3

NAME______________________________ TITLE Test TGA 1 NO.__________

COURSE______________ INSTRUCTOR______________ DATE______________ BOOTH__________


A1
2
3
4
5
6
B1
2
3
4
5
6
C1
2
3
4
5
6
D1
2
3
4
5
6
E1
2
3
4
5
6
F1
2
3
4
5
6

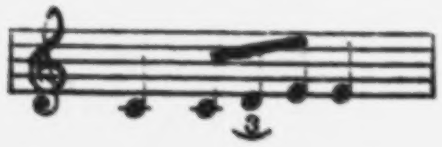
Tape II

TONE GROUP TEST

Mode II

There will be two parts on this tape. Make sure that the machine is on "record" and that the volume level is up. On the first part you will be asked to look at the tone group on the printed page. You will be given the first tone and you will be asked to sing this group (in your vocal range) and to record it on the tape. Here is a example:

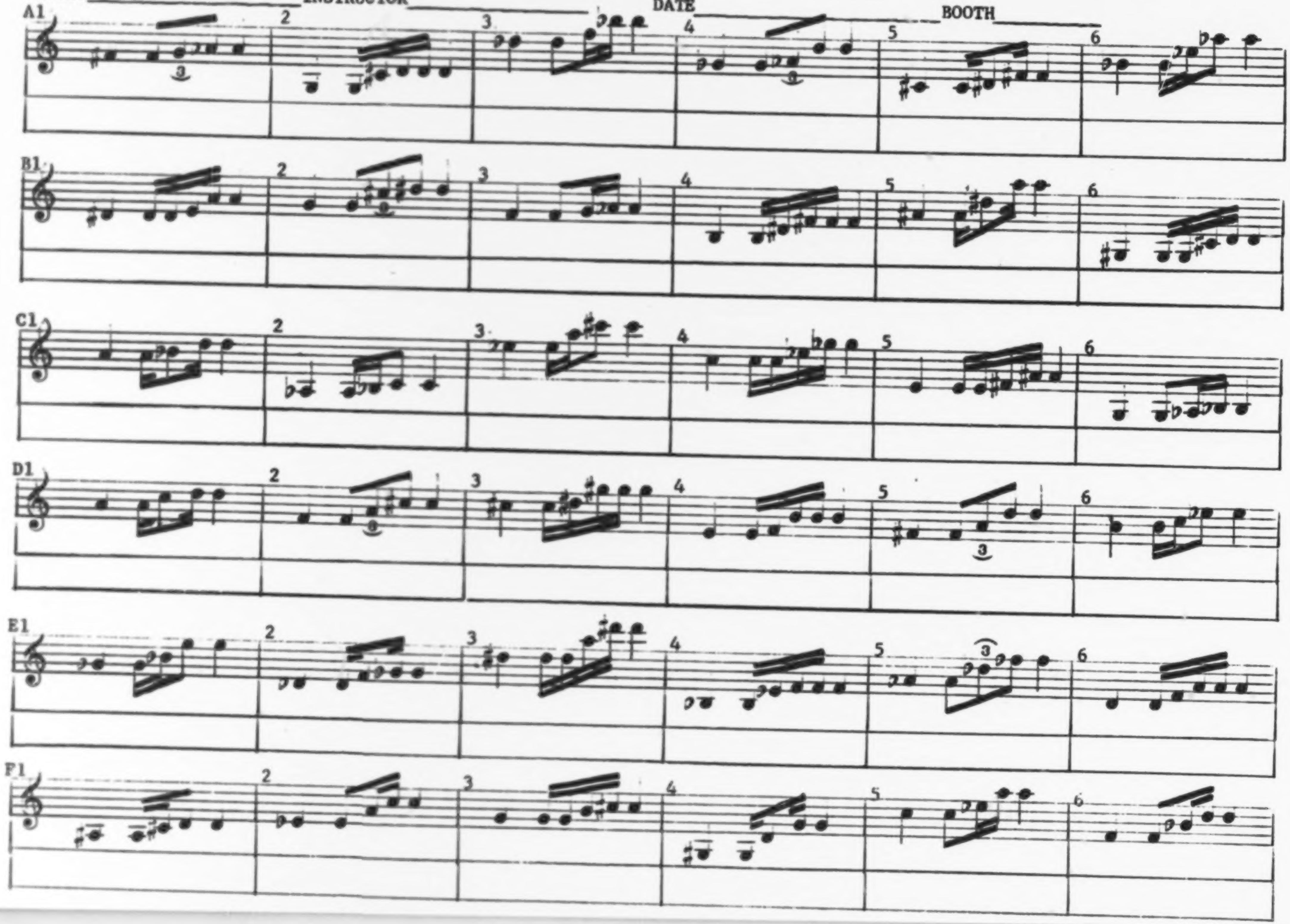
(Sing and record the tone group below)



You should have sung quarter "c", triplet "c - d - e" and quarter "e".

NAME____________________ TITLE Test TGA 2 NO.________

COURSE__________ INSTRUCTOR__________ DATE__________ BOOTH________


A1
2
3
4
5
6
B1
C1
D1
E1
F1

Tape II

TONE GROUP TEST

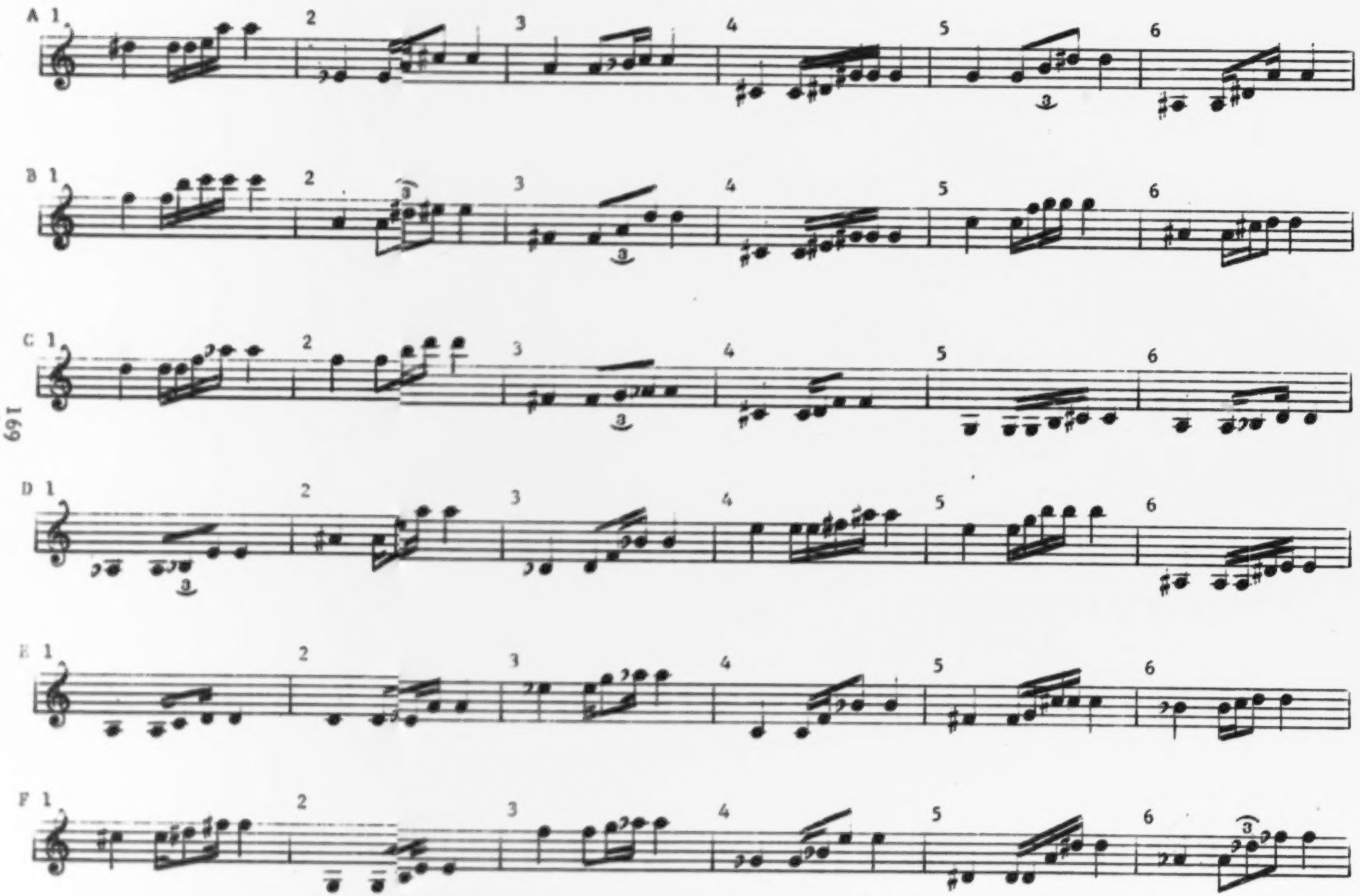
Mode III

This is the second and last part on this tape. You will hear the tone group played on the piano. You will be asked to sing the tone group (in your vocal range) with the syllable "ta" and to record it on the tape.

Here is an example:

(Sing and record the tone group played on the piano).

Tone Group Test TGA3

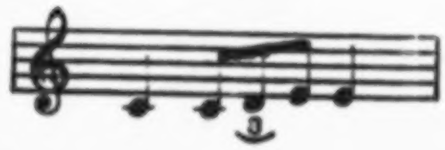

A 1
2
3
4
5
6
B 1
2
3
4
5
6
C 1
2
3
4
5
6
D 1
2
3
4
5
6
E 1
2
3
4
5
6
F 1
2
3
4
5
6

Tape I

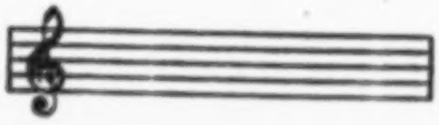
TONE GROUP TEST

Mode IV

On part II of this tape you look at each tone group on a printed card and you will be asked to write the tone group in notation on the staff. You will be given time to look at each group and time to write. Now look at the example.



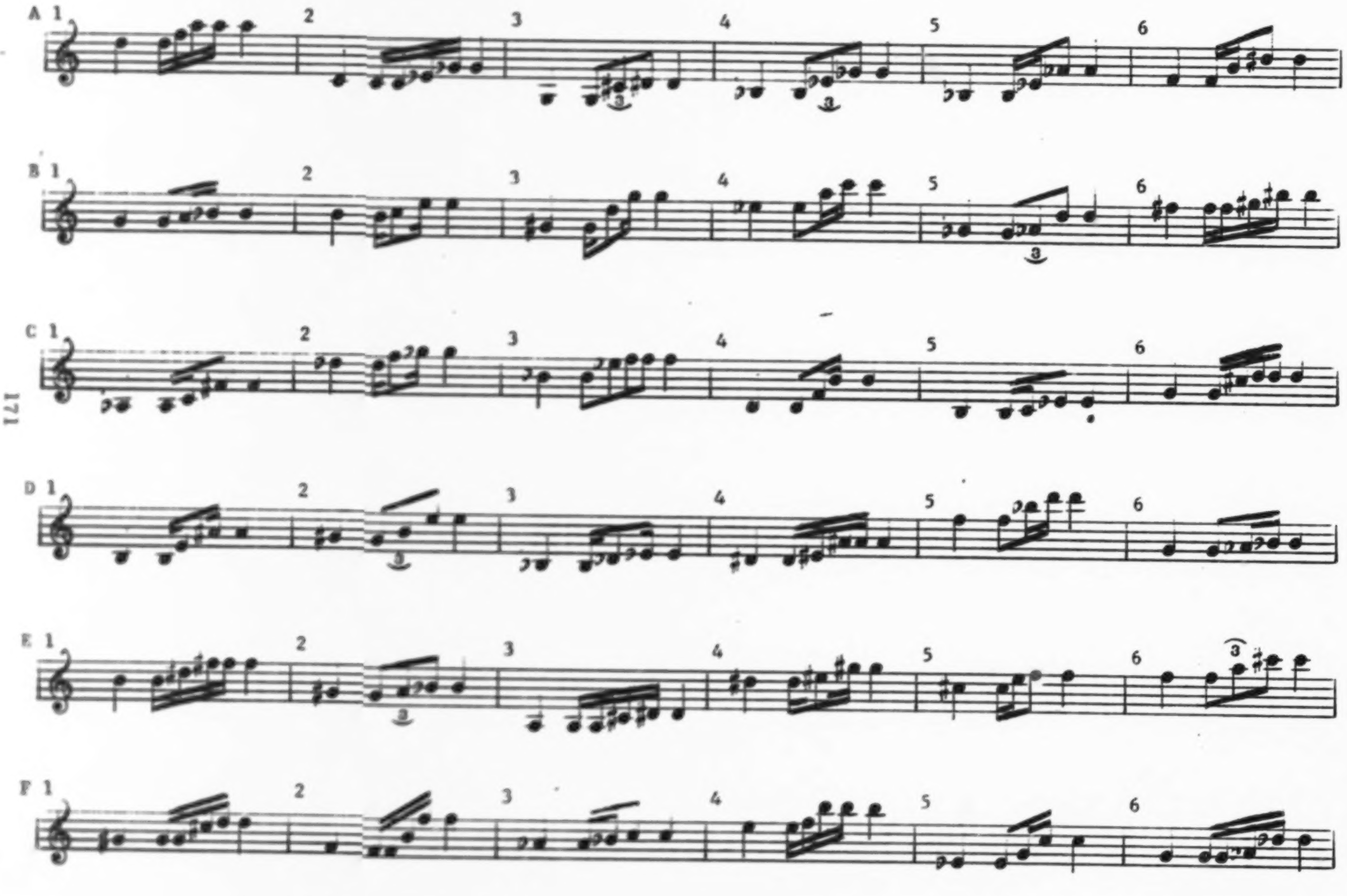
(Write the tone group on the staff below).



You should have written the following:

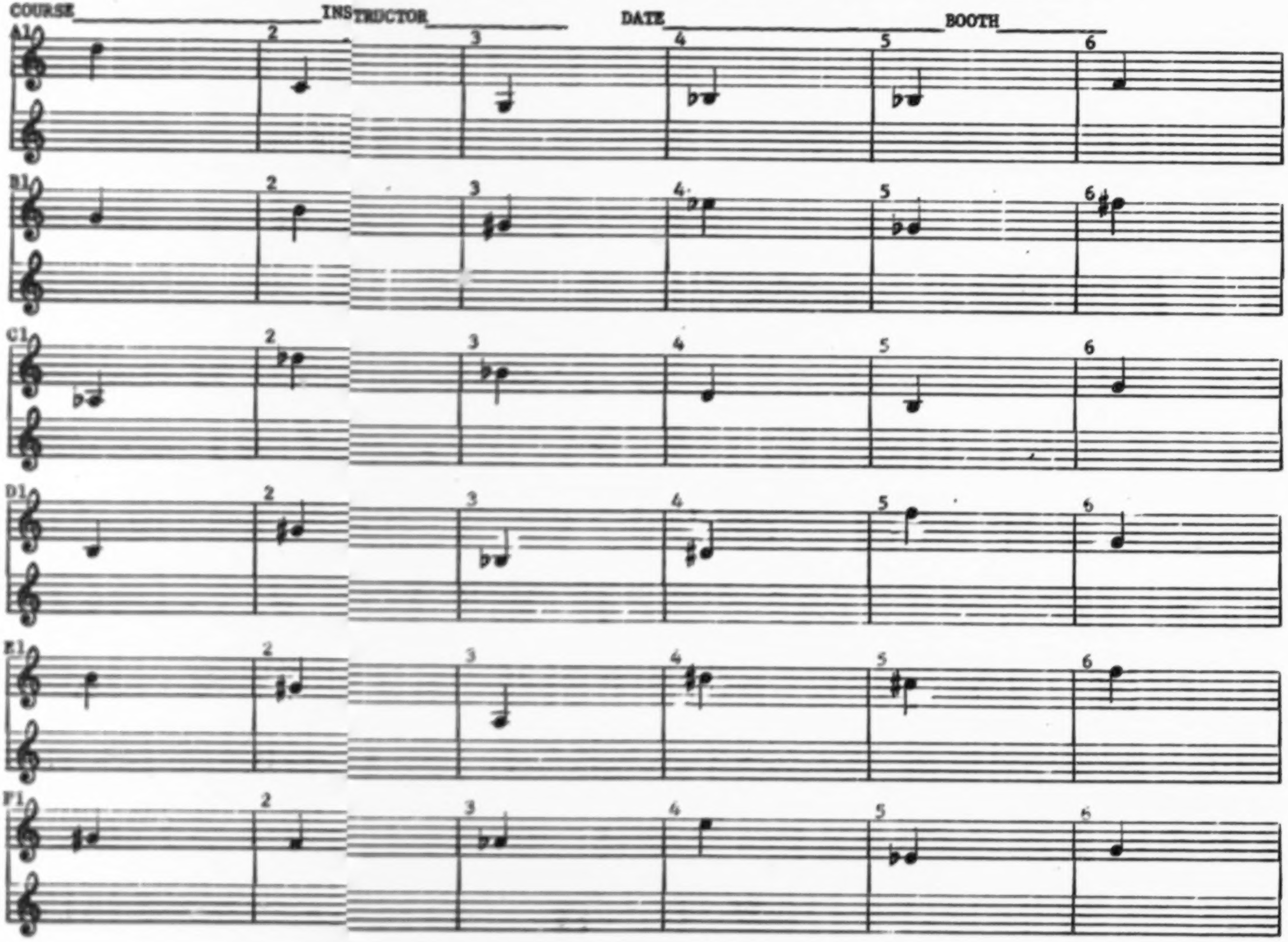
quarter "c," triplet "c - d - e,"
quarter "e".

Tone Group Test TGA$_4$


A
B
C
D
E
F
1
2
3
4
5
6
3

NAME____________________ TITLE Test TGA 4 NO.________

COURSE____________ INSTRUCTOR________ DATE____________ BOOTH________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